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THE EFFECTS OF CONTINUOUS WORK UPON OUTPUT AND FEELINGS

A. T. POFFENBERGER

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In the course of an investigation of the effects of continuous physical and mental work[1] a series of reports was obtained from the subjects doing mental work in regard to their feelings. The relation between changes in output of work and changes in the feelings will be discussed in this paper.

Four forms of mental work[2] were used, each continued for approximately five and one-half hours, or until the subject refused to work longer. They were:

1. Continuous addition which consists in adding to a two-place number first 16, then 17, then 18, then 19, then 16, etc. At the end of each 30 seconds a new two-place number is given. The score is in terms of number of additions done correctly per 30-second period. At the end of each half hour of work the subject reported how he felt, in terms of a scale which will be described later.

2. Sentence Completion. A series of 39 sets of Sentence Completion material taken from the Thorndike Entrance Examination for High School Graduates, divided into groups of 24 or 36 according to difficulty. Twenty-one minutes were allowed for work on each group, the score being in terms of amount of work done correctly in that time. At the end of each 21 minutes the subject reported how he felt.

3. Judging Compositions. A series of 130 compositions

[1] This is an investigation made possible by the Ernest Kempton Adams Research Fellowship granted for the year 1922.

[2] The conditions of the experiment and description of material together with tables of original data have been published in the American Journal of Psychology, 1927, *39*, 283-296.

upon various topics to be evaluated upon the Hillegas Composition scale. The time required for each ten specimens and the average error of judgment formed the measure of work. In this report only errors will be studied. At the end of each set of 10 compositions the subject recorded how he felt.

4. Intelligence Tests. Fourteen forms of Part I of the Thorndike Intelligence Examination for High School Graduates. The score was in terms of the amount done correctly in each period of 21 minutes. This time was short enough to make it impossible for any one to finish the test before time was called. At the end of each 21-minute period the subjects reported how they felt.

Toward the close of the experiment with each of the four kinds of material a rest period of 10 minutes was introduced. This was followed by a feeling report, a short period of work, and a final feeling report.

The feelings were recorded on a scale of seven steps as follows:

1. Extremely good
2. Very good (as after a good night's rest).
3. Good
4. Medium
5. Tired
6. Very tired (as at the end of a hard day's work)
7. Extremely tired

It is fully recognized that an evaluation of feelings on this scale is subject to all the errors commonly noted in scale ratings, plus those which may be due to the elusive experiences which are to be rated. One cannot equate the meaning of "very tired" among the different subjects, although there is reason for believing that the scale was a fairly constant one for any given subject. There is no way known at present for entirely eliminating such errors, nor of greatly reducing them without adopting a technique too elaborate for our conditions, which required that a minimum of time be spent between work periods.

The average records of 10 to 13 subjects in the four kinds of task are presented in very condensed form in table 1. Changes in output during the course of the work are expressed in terms of

per cent of the amount of work done in the first work period, and changes in the feelings are expressed in terms of the gross difference between the feelings before the work began and the feelings following each work period. Output in the first work period for each type of work, therefore, appears as 1.00, and

TABLE 1

Output of work and feeling reactions

Output in terms of per cents of first record. Feelings in terms of amount of change from first record.

	INTELLIGENCE TESTS		COMPLETION		COMPOSITION		ADDITION	
	Per cent output	Feeling change	Per cent output	Feeling change	Per cent output	Feeling change	Per cent output	Feeling change
Before work		0		0		0		0
1	1.00	−0.2	1.00	0.3	1.00	0.3	1.00	0.2
2	1.07	0.8	1.00	0.3	1.03	0.3	1.01	
3	1.10	0.2	0.93	0.6	1.07	0.9	0.99	0.8
4	1.11	0.5	0.98	0.8	1.07	1.3	0.98	
5	1.15	0.6	0.99	0.9	0.92	1.3	1.00	1.1
6	1.16	0.6	1.11	1.3	0.98	1.5	1.02	
7	1.16	0.7	1.04	1.5	0.89	1.6	0.97	1.4
8	1.17	0.8	1.10	1.8	0.96	1.8	0.98	
9	1.16	1.1	1.04	1.9	1.11	1.8	0.94	1.4
10	1.18	1.2	0.93	2.0	0.95	1.8	0.92	1.6
11	1.16	1.3	1.01	2.3	1.14	2.0	0.91	1.8
12	1.20	1.3	1.02	2.3	1.05	2.2	0.87	2.0
13	1.19	1.3	1.00	2.6	0.95	2.3	0.87	2.2
14			1.10	2.7	1.04	2.0	0.80	2.1
Rest								
Before work		0.3		1.6		0.7		1.1
15	1.18	0.6	1.00	2.2	0.94	1.0	0.88	1.2

the feeling record before the first work period appears as 0 in the table. Changes toward the more unpleasant feelings are indicated by a + sign and toward the more pleasant feelings by a − sign. Dash lines inserted in the table indicate that the record is missing at that point.

A comparison of the direction and amount of change of output and feelings for the different tasks may be made more readily from the curves in figure 1.

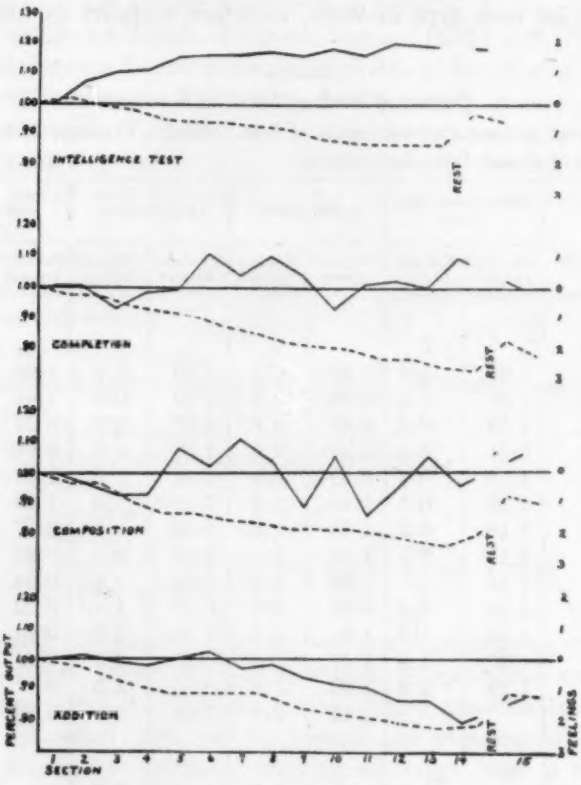

FIG. 1. RELATION BETWEEN OUTPUT AND FEELINGS IN FOUR FORMS OF MENTAL WORK

Solid line represents output and dotted line represents feeling record

The output scale is on the left and the feeling scale on the right. The solid line indicates output and the broken line the feelings. It is obvious from an inspection of these curves that there is no positive relationship between average amount

of loss in output as a result of continuous work and average amount of change in the feelings. In the case of the Intelli-

TABLE 2

Initial feeling report for each subject in each task

	SUBJECT												
	I	II	III	IV	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Intelligence Test.....	3	1	4	2	3	3	7		4	4	3	6	2
Completion.....	3	2	4	4	2	2	2	2	3	4	3	3	
Composition.....	3	3	4	4.3	2	2	2	4	3	2.7	4	3	
Addition.....	3	2	4	4	2	3	4		3	3	4		

TABLE 3

Comparison of feelings accompanying greatest and least change in output smoothed individual curves

	INTELLIGENCE TEST				ADDITION			
	Subject IV		Subject XII		Subject II		Subject XII	
	Output	Feelings	Output	Feelings	Output	Feelings	Output	Feelings
Before work		0		0		0		0
1	1.00	0.6	1.00	0	1.00	0	1.00	0
2	1.05	1.3	1.45	0	0.87	0	1.09	0
3	1.07	1.3	1.55	0	0.84	2.0	1.09	0
4	1.09	1.3	1.68	0	0.99	2.0	1.09	0
5	1.09	1.0	1.73	0	1.00	3.0	1.12	0
6	1.09	1.0	1.71	0	1.01	3.0	1.12	0
7	1.05	1.6	1.70	0.3	0.94	4.0	1.13	0
8	1.06	2.3	1.68	0.6	0.88	4.0	1.10	0
9	1.06	3.0	1.67	1.0	0.89	4.0	1.08	1.0
10	1.08	3.3	1.64	1.3	0.80	4.0	1.04	1.0
11	1.02	4.0	1.66	1.5	0.75	4.0	1.05	1.0
Rest Before work		1.0		0		2.0		1.0
12	1.18	1.0	1.61	1.0	0.62	4.0	1.06	1.0

gence Test, there is an *improvement* of nearly 20 per cent in output and a loss up to the rest period of 1.3 steps on the feeling

scale, while for addition there is a *loss* of output of 20 per cent with a feeling loss of 2.1 steps. That is, regardless of whether there is a gain or loss in output, there is a fairly uniform loss in the feeling record. Comparing Composition with Addition in regard to output we find practically no change in the former and a 20 per cent change in the latter, yet there is no significant difference in the feeling change in the two cases. These results corroborate the findings of Thorndike.[3] He had five individuals judge the quality of compositions continuously for four hours and found an improvement in quality of work amounting to 8 per cent with a falling off in satisfyingness of nearly 4 steps on a scale running from 10 down to 0.

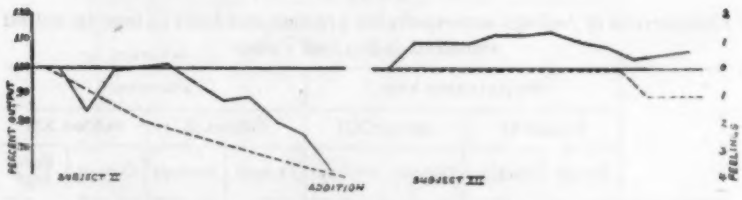

FIG. 2. FEELING RECORD OF SUBJECTS MAKING GREATEST AND LEAST CHANGE IN OUTPUT—ADDITION

The introduction of the 10-minute rest period in the present experiment brings an improvement in the feeling state in every kind of task by an amount which is surprisingly uniform regardless of the amount of loss in output of work before rest. In terms of steps on the feeling scale these changes are 1.0, 1.1, 1.3, and 1.0. Whatever the condition of these feelings, therefore, they are affected in one direction by work and in the other direction by rest. Again, the change in feelings as a result of rest bears no clear relationship to the change in output as a result of rest.

A difficulty arises in computing feeling change due to the fact that individuals differ considerably in the state of their

[3] Thorndike, E. L., The Curve of Work and the Curve of Satisfyingness. Journal of Applied Psychology, 1917, *1*, 265 ff.

feelings before the work begins. It is obvious that the course of change for one who begins with a feeling report of 1 will be likely to differ from that of one who begins with a feeling report of 7. In most cases, however, the original feeling was such as to allow a considerable loss as the result of work. We can not assume anything about the relative value of the steps on the feeling scale, that is, whether the change from one to two equals or differs from the change from 6 to 7. The initial feeling report for each subject at the beginning of each task is given in table 2. In two cases, namely, subjects VIII and XIII in the Intelligence Test, the initial feeling report was so low as

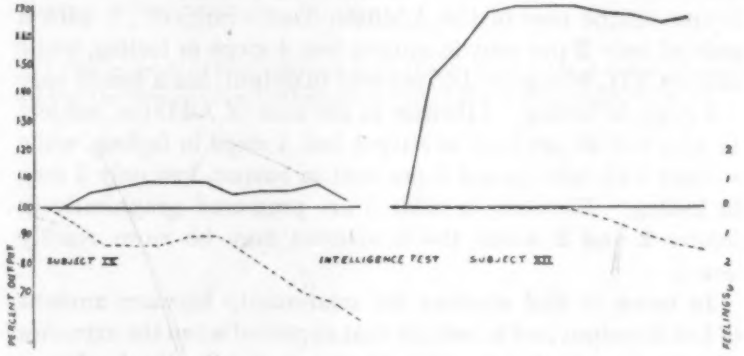

FIG. 3. FEELING RECORD OF SUBJECTS MAKING GREATEST AND LEAST CHANGE IN OUTPUT—INTELLIGENCE TEST

to preclude change as the result of work. In spite of this fact these records were averaged in with the others. Even so, the average loss in feeling quality was almost as great in the Intelligence Test as in the Addition Test.

Our examination of the records has been limited thus far to a consideration of average curves for the four kinds of task, where we found no consistent relationship between change in output and change in feelings. We shall now examine the individual records to see if perhaps that individual who loses least in output loses least also in feelings, and that individual who

loses most in output also loses most in feelings. We may begin by choosing from the Intelligence Test records and the Addition Test records the subject having the least loss and the one having the greatest loss in output and then comparing their feeling records. The resulting data are given in table 3, where the figures are computed by means of the sliding average (by threes), thus smoothing out the variations and at the same time reducing the number of periods to 11. The feeling data, being the amount of change from the initial record as in table 1, are treated also by the sliding average method. In the case of the Intelligence Test the subject making the greatest gain (or least loss) has the smallest loss in feeling quality, and the same is true in the case of the Addition Test. Subject IV with a gain of only 2 per cent in output lost 4 steps in feeling, while subject XII, who gained 66 per cent in output, has a loss of only 1.5 steps in feeling. Likewise in the case of Addition, subject II who lost 25 per cent in output lost 4 steps in feeling, while subject XII, who gained 5 per cent in output, lost only 1 step in feeling. The data in table 3 are presented graphically in figures 2 and 3 where the tendencies may be more readily noted.

In order to find whether the relationship between amount of loss in output and in feelings that appeared when the extremes of output were taken would hold more generally, the 4 subjects showing the greatest loss in output were compared as to feeling change with the four showing the least loss in output. The results follow:

	FEELING CHANGE	
	Intelligence	Addition
	steps	*steps*
4 showing greatest loss in output	2.0	3.25
4 showing least loss in output	1.25	1.25

With so few cases it is futile to attempt to determine the reliability of these differences. The most that can be said is that

the results suggest that those persons who lose most in output as a result of work tend to lose most in feeling quality and vice versa.[4]

The results of this study may be stated very briefly:

1. When the records of a number of subjects are averaged there appears to be no positive relationship between changes in output of work in a variety of activities and changes in the feelings.

2. When the individual cases are examined there is at least the suggestion that those who show the greatest falling off in output also show the greatest change in the feelings, and those who show the least falling off in output also show the least change in the feelings.

[4] The two sets of four subjects were chosen from a total of ten, so that all but the two intermediate cases are included in our comparison.

THE RELIABILITY AND VALIDITY OF THE SEASHORE TESTS OF MUSICAL TALENT[1]

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I. INTRODUCTION

In clinical practice the psychologist is expected to make certain observations and recommendations on the basis of objective tests. It is necessary, therefore, for these practical purposes that information concerning any measure, such as its reliability and validity, be available before it can be used. Such information should be, of course, a part of the test construction and should be distributed along with the test material. It is true that this information, especially reliability, is available for most tests, but unfortunately for some tests it cannot be secured.

Validity is difficult to determine and it may be good practice to distribute for use a test which shows a fair distribution, differentiates different age groups fairly well, and has a fairly high reliability, and let time and use determine if the test measures what the author claims for it. Some of the best intelligence tests have been proved in this way to be valid. However, there is danger that the practitioner in his eagerness to secure tests of different abilities will seize upon any test that is given a name and use it without adequate knowledge of what it measures. A so-called mechanical test, for example, may be standardized on 10,000 cases, may be a very reliable measure, may have age and grade norms, and yet may be a measure of intelligence rather than mechanical ability.

[1] Studies from the Institute for Juvenile Research, Chicago. Herman M. Adler, Director. Series C, No. 141.

II. PREVIOUS STUDIES

Few studies other than the original work of Seashore[2] himself have been made of the Seashore Tests of Musical Talent. As is well known these tests consist of six phonograph records—one each for pitch, intensity, time, memory, consonance, and rhythm. Seashore, on the basis of experiments with these tests without presenting much evidence in many cases makes the following significant statements:

1. The physiological limit of pitch discrimination does not vary with age.
2. Pitch discrimination does not vary with sex.
3. The physiological limit of pitch discrimination does not vary with intelligence for normal individuals.
4. The sensitiveness of the ear to pitch differences cannot be improved appreciably by practice.
5. Hearing of pitch is an instinctive capacity which comes into function very early in infancy and develops quickly in the individual on account of the biological function that it has served and now serves.
6. Within the realm of his acquaintance with sounds, the child has as keen an ear for intensity as the adult.
7. Intensity discrimination rests mainly upon delicacy of structure in the ear, which has no relation to intelligence.
8. The discrimination of differences in intensity is not improved by training.
9. The discrimination of differences in the duration of time interval varies only slightly with age, training or intelligence and correlates with pitch discrimination to the degree of 0.17 ± 0.04.
10. Rhythm is instinctive. However, that enormous individual differences in this endowment exist, is a noted, if not notorious, fact.
11. Ability to determine the more harmonious of two series of tones, depends to some degree upon training, yet not to any such extent as is ordinarily supposed. The sense of consonanceis a gift which reveals itself like the sense of pitch or the sense of rhythm very early in childhood.
12. Musical Memory is capable of cultivation on a large scale. It does not, however, correlate very closely with general ability in school work.

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[2] Seashore, C. E. The Psychology of Musical Talent.

These are some of the general claims which the author makes in regard to these tests and the abilities measured by them. It is important to know to what extent they are true.

A study of the validity of the Seashore Tests has been made by Dr. Flora Brennen.[3] Part of the study consisted of correlating the rating of the performance of twenty students of music against their capacity as measured by the Seashore Tests. The ratings were made by four expert musicians on the basis of a selection played by the students. The identity of the students was concealed from the judges. The students ranged from the seventh grammar grade to seniors in college. The training of the students varied from ten half hour lessons to eight hundred half hour lessons. The judges gave ratings on time, tone quality, intensity, rhythm, and artistic unity of the performance of each subject. For correlation purposes, the ratings assigned by the judges to each student were averaged and a rank for performance as a whole was obtained by averaging the ranks each student received in each of the five criteria. The correlations, by the Spearman rank formula, between the rank for performance as a whole, as rated by expert judges, and capacity, as determined by the tests, were as follows: Pitch 0.27 $\pm$0.14; intensity 0.17 $\pm$0.14; time 0.23 $\pm$0.14; consonance 0.28 $\pm$0.14; memory 0.47 $\pm$0.12; rhythm 0.47 $\pm$0.12.

The correlations between training as indicated by the number of half hour lessons the student had had and his rating on the tests were as follows: Pitch 0.42 $\pm$0.12; intensity 0.25 $\pm$0.14; Time 0.38 $\pm$0.12; Consonance 0.02 $\pm$0.17; Memory 0.55 $\pm$0.10; Rhythm 0.74 $\pm$0.07. These correlations indicate that there is a closer relation between the number of hours of musical instruction the student had had and his score on the test, than there is between his score on the tests and his performance. These correlations fail to warrant some of the claims made for the tests by their author.

As is noted above there is a wide variation in the age and amount of musical training of the subjects taking part in the

[3] Brennen, Flora Mercer. The relation between musical capacity and performance. Psychological Monographs, Vol. XXXVI, No. 1.

investigation, and the correlation that exists between capacity as measured by the tests and the ratings of the judges may be due to one or the other or both of these factors. Before the validity of the tests can be established these factors should be controlled.

Dr. Hazel M. Stanton[4] has attempted a rough validation of the tests by comparing teachers' ratings of students with students' scores on the tests. While she does not give any correlation coefficient between these variables she presents three scatter diagrams and a number of individual charts. These charts show that undoubtedly there is some relationship between the tests and teachers' judgments, but they fail to state the degree of that relationship.

III. PRESENT STUDY

The object of this study is to get some data on the reliability of the Seashore Tests and also to determine to what extent the tests can be used to predict success in musical training.

The subjects used in the experiment were the Junior and Senior students of LaSalle-Peru Township High School. Intelligence test scores were to be used in the study, and ratings on Army Alpha were already available for all the students, and for about 80 per cent of them there were also ratings on the Otis Advanced Intelligence Examination. To get a final intelligence rating, the ratings on the two tests were turned into IQ's and averaged. Where there was only one intelligence rating, that rating was used.

The six Seashore Tests were given twice to the same group of junior and senior high school students. There was an interval of about four months between the tests. The first examination was given in three groups of about thirty-five each. The second was given in two groups of about forty-five each. The ordinary class room was used for the tests. The students reported that they could hear distinctly.

[4] Stanton, Hazel M. Psychological Tests of Musical Talent, Eastman School of Music. The University of Rochester.

The reliability coefficients, the number of cases, the standard deviation of the first and second examination (σ_1 and σ_2 respectively) and the means of the first and second (M_1 and M_2 respectively) are given in table 1. These data are computed from the percentage right for each test.

These reliability coefficients agree closely with those secured by Ruch and Stoddard[5] with the exception of rhythm, in which case they report a coefficient of 0.50 on 58 cases. Compared with the reliability coefficients of intelligence tests these coefficients must be considered low.

TABLE 1

Reliability coefficients and other data on the Seashore Test of Musical Talent

(1 = first test, 2 = second test)

TEST	NUMBER OF CASES	(PEARSON) CORRECTION	σ_1	σ_2	M_1	M_2
Pitch	93	0.71 ±0.03	17.16	7.4	77.0	66.2
Intensity	91	0.65 ±0.04	6.1	8.9	71.5	85.4
Time	91	0.48 ±0.05	9.4	8.3	77.3	73.1
Consonance	91	0.43 ±0.05	11.8	7.4	77.0	66.0
Memory	90	0.59 ±0.04	18.5	16.5	64.8	68.3
Rhythm	89	0.29 ±0.06	9.4	8.2	74.0	74.0

An attempt was made to get some further evidence on the validity of these measures. After the tests were given the first time the musical instructor was asked to rank the 108 students on the basis of their musical capacity. Care was taken to emphasize the fact that he was not to rank them on the basis of their musical training or experience, but as far as possible on what he considered to be their "natural talent" or innate ability. In order to secure some estimate of the reliability of his ranking he was asked to rank them again. The second ranking was made about four months after the first. On this second attempt he was asked not to recall his first ranking but rank them again on the basis of their natural musical ability.

[5] Ruch, G. M., and Stoddard, G. D. Tests and Measurements in High School Instruction, page 195.

The Spearman correlation between these two ranks for 108 cases was 0.94 ±0.01. The average of these two ranks was taken as the criterion of musical ability. The correlation of the tests with this average rank is the measure of validity considered in this study.

The average of these two ranks was turned into sigma values so the Pearson formula could be used in correlating the test scores with this criterion.

Table 2 gives the correlation coefficient of each test with the criterion as well as the correlation of the average score on all the tests with the criterion. The average score is the average

TABLE 2

Correlation between Seashore Tests of Musical Talent and teachers' judgment of musical ability

(N = 105)

TEST	CORRELATION
Pitch	0.15 ±0.06
Intensity	0.11 ±0.06
Memory	0.41 ±0.05
Time	0.15 ±0.06
Consonance	0.17 ±0.06
Rhythm	0.17 ±0.06
Average score	0.38 ±0.05

of the percentile ranks on each of the individual tests. With the exception of memory and the average score the correlations with this criterion are low. In other words, as far as the teacher's judgment is a criterion, the individual tests with the exception of "memory" fail to predict the capacity for musical training to any marked degree. It is interesting to note that the "memory" test correlates more highly with the criterion than does the average score on all six tests. These correlations are in each case a little lower than those found by Brennen but with the exception of rhythm (in which case she found a correlation of 0.47 ±0.12) the results agree within the range of the P.E. of the correlations. In each study the test for "mem-

ory" gives the highest correlation with the criterion. The correlation of 0.38 ±0.05, considering the inadequacy of the criterion, is significant.

It was considered possible that this relationship between teachers' judgment and the score on the test might be due to difference in age, experience or differences in intellectual abil-

TABLE 3

Intercorrelations between age, music score, teachers' ranks and intelligence ratings

	TEACHERS' RANKING	AVERAGE SCORE ON MUSIC TESTS	INTELLIGENCE RATINGS
	(1)	(2)	(3)
Age	0.10	−0.20	−0.34
Teachers' ranking		0.38	0.15
Average score on music tests (4)			0.24

TABLE 4

Intercorrelations of the Seashore Tests of Musical Talent

(N = 108 High School juniors and seniors)

	INTENSITY	MEMORY	TIME	CONSONANCE	RHYTHM
Pitch	0.25	0.52	0.20	0.29	0.16
Intensity		0.00	0.40	−0.04	0.23
Memory			0.20	0.22	0.33
Time				0.09	0.00
Consonance					0.09

ity, so an attempt was made to find the relationship with these variables held constant.

Table 3 gives the intercorrelation between these different variables with the exception of the amount of musical experience. An attempt was made to get an objective statement of the students' of their musical training in terms of the number of half hour music lessons each student had received. There were in this group of junior and senior high school students, however, so many who had received no training at all that any

correlation between musical experience and any other rating would be unreliable. This factor therefore could not be ruled out.

It was, however, possible to control age and intelligence. When age was held constant the correlation between Teachers' Rank and average score on music tests was reduced only to 0.37. When intelligence was held constant the correlation was reduced to 0.35. When both age and intelligence was partialled out the correlation still remained 0.35. It would seem therefore that neither intelligence nor age has much influence upon the correlation between teachers' judgment of musical ability and that ability measured by the Seashore Records.

Table 4 gives the intercorrelations between the six tests of the Seashore series. The correlations with two or three exceptions are low. It is evident that if these records are tests of musical talent, then each tests a different function of it. However, in reporting the results of these tests each is reported individually. It is possible that a high score on each of these tests may not indicate that an individual is endowed with superior musical ability. The ability to respond to these isolated factors may be quite different from the ability to respond to a combination of them. In fact a combination of the elements may present a situation which has very little relation to the elements of it. This fact has been well illustrated in the development of intelligence tests. Attempts to measure isolated functions of general intelligence such as memory, attention, perception, reasoning etc., did not prove very profitable. Binet's success was due largely to the fact that he abandoned such attempts and presented general problems. It may be that a test of general music ability might prove more valuable than a series of tests of the isolated factors.

CONCLUSIONS

1. The reliability coefficients of the Seashore Tests with the exception of that for pitch, intensity and perhaps memory must be considered low.

2. The validity of the individual tests as determined by their correlation with teachers' judgment as a criterion is also low. The average rating on all the tests gives a moderate degree of relationship with teachers' judgments of musical talent.

3. There is little relation between intelligence and musical ability as measured by these tests.

4. The age and intelligence of high school juniors and seniors have little effect on the score of the music tests.

5. The intercorrelations between the six Seashore Tests of musical talent are low.

SOME OBSERVATIONS CONCERNING THE RELIABILITY OF THE PRESSEY X-O TEST

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The observations for this study were made at Purdue University during the school year of 1924–1925. The students in elementary psychology served as the subjects. There are complete records for 150 engineering students, 98 women, and 58 men in the School of Science. Most of the students ranked as sophomores.

The Pressey X-O Form A was given the Engineering students upon two different occasions, three months apart, to determine the reliability of the test. Scores were also correlated with intelligence test scores and grades. Certain other observations and correlations were made to see what the correlations of separate tests of Pressey X-O test were. The intelligence test given the Engineering students was Morgan's Mental Test, while the men and women in the School of Science were given the Otis Self-Administering Higher Examination.

The purpose of this paper is (1) to supplement the norms of Pressey, (2) to point out the sex differences that are revealed by rather laborious tabulations, and (3) to present data relative to the validity and reliability of the tests. In comparing the responses of men and women the same classification of terms in the test as Pressey used has been followed. The words in Tests I and IV are divided into the suggested clinical categories. The jokers for Test I are not tabulated since in no case were they crossed out more than 4 per cent of the time, usually from 0 to 3 per cent. The other categories of sex, fear, disgust, and suspicion have been separated so that the percentages of times

TABLE 1

Per cent of times crossed out

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
Disgust words							
disgust	72	68		vomit	78	92	W.
wiggle	42	69	W.	smell	24	37	W.
spit	67	87	W.	flesh	13	27	W.
rotting	64	85	W.	leg	53	24	M.
gutter	74	77		swamp	9	22	W.
worm	57	74	W.	slippery	31	36	
crawl	48	52		butcher	20	43	W.
dirty	79	78		pus	85	95	
sewer	74	76		sticky	54	54	
drunk	75	92	W.	bladder	52	70	W.
stink	90	97		yellow	23	15	
filthy	87	100	W.		1,368	1,538	
ugly	72	78					
sneeze	25	40	W.	Index	54.72	61.52	
Sex words							
sex	20	45	W.	immoral	73	79	
divorce	67	73		skirt	6	3	
naked	40	65	W.	tough	34	40	
hug	11	36	W.	pregnant	60	67	
breast	7	27	W.	tickle	18	34	W.
street-walker	65	75		assault	68	74	
shirt	5	13		abortion	48	57	
undress	23	30		engagement	4	3	
pervert	38	33		pox	73	85	W.
flirt	36	48	W.	baby	5	10	
skin	6	12		indecent	73	87	W.
stocking	6	1			905	1,165	
suck	56	81	W.				
illegitimate	63	87	W.	Index	36.20	46.60	

TABLE 1—*Continued*

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
Fear words							
fear	56	50		electricity	4	5	
roar	27	36	M.	blood	36	60	W.
fight	32	38		slash	87	62	M.
snake	72	67		kill	68	65	
thunder	21	21		spider	46	62	W.
tremble	30	13	M.	cannibal	60	54	
cruel	76	72		poison	71	62	
insanity	79	78		detective	14	13	
dizzy	41	44		falling	23	15	
choke	48	50		dream	4	11	
influence	3	3		crazy	58	54	
execute	27	27					
black	18	7		Index	38.04	40.28	
fever	50	38					
Suspicion words							
suspicion	62	63		whisper	6	11	
dislikes	54	31	M.	cheat	75	78	
snicker	51	55		giggle	41	39	
failure	69	60		voices	1	3	
insult	77	63	M.	sin	73	77	
rival	25	23		persecute	54	51	
favorite	2	3		contempt	54	58	
slight	9	8		queer	18	15	
nervous	1	45	W.	homely	33	32	
unfair	3	50	W.	disgrace	85	74	
worry	2	50	W.	shame	65	58	
loss	6	27	W.				
meanness	49	44		Index	38.24	42.80	
loneliness	41	42					

each word was crossed out by both men and women are given separately in the table. The five categories of Test IV are: neurotic, hypochondriacal, paranoid, self-conscious and melan-

cholic. These have been separated and compared as in Test I. The responses to the other two tests are presented serially, as they are not classified according to clinical types.

The significant difference between the two sexes in the responses to any word have been determined according to the Bernoulli theorem.[1]

$$\text{P.E.} = 0.6745\sqrt{\frac{p\,q}{n}}$$

p = probability of function happening, q = probability of function not happening, n = number of cases.

A difference has not been considered significant unless it exceeds the limits of ± 3 P.E. These limits indicate practical certainty of a significant difference. Such differences are checked in a third column, the letter M or W tells for which sex the word has the stronger feeling tone.

Following the tabulations of the words crossed out are tabulations of the encircled words. This comprises the second part of each test. The percentages are not given as the underlying logic is essentially sound, viz., that those responses are abnormal which noticeably deviate from the mode.

THE DATA

In Test I the individual is to cross out every word whose meaning is unpleasant, it being allowable to cross out every word if he chooses. Table 1 shows the percentage of men crossing out each word and the percentage of women crossing out the same word. The letter in the third column indicates whether or not the difference is significant. At the bottom of each column is the index of unpleasantness for men and for women, for each category of words. The index is the sum of the percentages divided by 25, the total number of words in each category. Table I is to be read as follows: the word

[1] See Rietz, H. L., et al. A Handbook of Mathematical Statistics, p. 74.

TABLE 2

Percentage crossed out

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
flame	17	68	W.	wheat	9	5	
flower	76	50	M.	queer	42	78	W.
paralyzed	4	45	W.	judge	4	78	W.
red	68	63		marriage	49	43	
sew	10	4		cloud	3	4	
poor	39	36		brave	85	76	
headache	39	73	W.	disgust	27	44	W.
match	64	31	M.	sweet	54	33	M.
dogs	7	4		wood	3	4	
light	79	69		truth	82	92	
naked	87	65	M.	crime	52	50	
choke	10	55	W.	longing	34	48	W.
tree	7	4		sickness	25	51	W.
alone	76	87	W.	floating	32	97	W.
danger	14	38	W.	heart	37	4	M.
father	54	60		beautiful	82	12	M.
baseball	30	5	M.	manhood	42	50	
queen	32	85	W.	bicycle	9	1	
rights	60	67		scream	56	27	M.
razor	9	36	W.	baby	74	1	M.
grade	17	7		head	40	27	M.
ache	43	77	W.	sale	8	2	M.
fright	9	21	W.	immoral	24	24	
tongue	42	27	M.	girl	47	81	W.
worry	67	63		contempt	6	44	W.
dark	68	74		cider	8	9	
fear	57	73	W.	undress	39	78	W.
hypnotize	15	75	W.	escape	53	7	M.
dead	36	23	M.	chills	37	42	
necktie	11	7		cook	2	4	
slimy	46	72	W.	female	30	40	
followed	8	13		disappointment	72	74	
strong	84	4	M.	die	30	52	W.
sky	4	4		lover	64	44	M.
kill	36	52	W.	home	31	62	W.
high	86	30	M.	trick	56	57	
fall	54	8	M.	laugh	30	59	W.

TABLE 2—*Continued*

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
cloth	2	5		snow	16	5	M.
funeral	35	13	M.	wife	55	24	M.
poison	35	4	M.	horrors	76	65	
work	62	15	M.	family	29	77	W.
stump	6			key	4	4	
shoot	32	95	W.	suspect	44	22	M.
children	69	86	W.	old	35	62	W.
memory	29	32		hope	25	34	
drunk	6	38	W.	broom	14	2	M.
clammy	60	87	W.	tired	18	36	W.
floor	20	9		never	29	54	W.
buried	33	92	W.	saw	6	11	
whip	29	5	M.	sin	24	54	W.
hang	11	79	W.	worry	72	15	M.
worms	62	11	M.	agony	52	74	W.
health	68	37	M.	country	31	4	M.
figure	82	60	M.	bed	20	70	W.
wrong	16	4	M.	drug	20	11	
terror	52	62		bare	39	10	M.
enemy	53	40	M.	fire	13	2	
unfair	73	39	M.	water	42	15	M.
ice	7	13		self	40	55	W.
plot	45	27	M.	welcome	35	88	W.
crawl	32	67	W.	hopeless	68	59	
jealousy	21	4	M.				

disgust was crossed out by 72 per cent of the men and by 68 per cent of the women. The difference is less than ±3 P.E. The word *wiggle* was crossed out by 42 per cent of the men and by 69 per cent of the women. The difference is at least ±3 P.E., etc.

Test II is a modification of the Kent-Rosanoff association test. Twenty-five of the list of 100 has been selected and for each word the five most common responses. This test is little different from the ordinary Kent-Rosanoff test with the exception that it is adapted to group testing. It, however, shows

TABLE 3

LIST	MEN	WOMEN	SIG. DIFF.	LIST	MEN	WOMEN	SIG. DIFF.
begging	62	66		king	27	18	
swearing	83	94		socialism	49	51	
smoking	48	44		dirty	92	95	
flirting	51	42		idle	71	77	
spitting	52	69	W.	conceited	81	87	
fear	28	19		tough	57	88	W.
hate	78	75		smutty	89	93	
anger	51	50		worry	27	40	W.
jealousy	75	89	W.	faultless	77	37	
suspicion	51	70	W.	day-dreaming	38	22	M.
dullness	37	34		tired	13	10	
weakness	39	58	W.	slow	31	22	
ignorance	63	71		divorce	74	74	
innocence	12	16		bankruptcy	37	38	
meekness	30	23		gang	41	34	
careless	79	79		overwork	29	33	
fussy	56	68	W.	politics	18	24	
reckless	77	81		dishonest	88	95	
silly	67	76		illegitimate	68	73	
childish	5	50	W.	failure	33	29	
poor	13	10		drunkard	87	92	
extravagant	77	80		coward	68	89	W.
sporty	43	60	W.	sad	21	18	
shrewd	10	20		bashful	48	15	M.
bad-mannered	87	94		stupid	66	69	
clumsy	39	30		easy	38	26	M.
slang	65	70		queer	47	31	M.
blues	23	97	W.	lazy	71	84	W.
dancing	6	9		mean	54	80	W.
snob	85	88		disgrace	71	80	
thief	84	98	W.	immodest	55	91	W.
prostitute	76	80		fighting	39	51	W.
grafter	90	97		prizefight	27	37	
thug	77	79		drugs	63	72	
gambler	80	96	W.	indecent	84	96	W.
war	44	53		loafing	71	84	W.
lynching	83	87		cheating	76	95	W.
revolution	41	38		debt	47	60	W.

TABLE 3—*Continued*

LIST	MEN	WOMEN	SIG. DIFF.	LIST	MEN	WOMEN	SIG. DIFF.
theater	28	6	M.	broker	40	47	
shabby	63	37	M.	lawyer	18	9	
proud	43	23	M.	millionaire	35	15	M.
chewing	64	93	W.	judge	13	7	
cheap	37	57	W.	priest	29	30	
smelly	67	90	W.	churchgoing	40	3	M.
stingy	86	89		fasting	18	19	
meddling	71	91	W.	cards	35	13	M.
pickup	58	61		quitter	13	91	W.
betting	56	66		over-eating	29	77	W.
squealer	72	87	W.	stubborn	66	60	
street-walker	58	85	W.	speculating	23	39	W.
cruel	65	80	W.	gossip	68	87	W.
graft	60	86	W.	pity	11	5	
mistress	20	37	W.	greedy	84	94	
scab	48	62	W.	boasting	80	86	
dopefiend	70	94	W.	nagging	62	94	W.
swindler	66	92	W.	persecute	52	55	
bully	65	92	W.	money	6	4	
strike	42	63	W.	overdressed	54	75	W.
lockout	50	52		teasing	55	42	
union	27	10	M.	sneering	87	91	
trust	37	11	M.	tricky	66	76	
detective	26	8	M.	insane	46	35	

up the association of words. The stimulus words are given in the first column, the percentage of times crossed out by the men in the second, the percentage of times crossed out by the women in the third, and the letters in the fourth column show the significant differences (±3 P.E. or more).

Test III: The subject is to cross out everything he thinks a person is to be blamed for or is wrong. The terms are not classified in the table but appear in the same order as on the test sheet.

The last test again has the words classified into the suggested clinical categories. The same plan for table 4 is followed as

TABLE 4

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
Neurotic							
noise	38	60	W.	windstorms	90	45	M.
sleep	28	25		exhaustion	34	28	
money	51	58		darkness	40	46	
falling	52	46		hysterics	19	37	W.
lightning	39	53	W.	gun	37	20	M.
accidents	70	75		crowds	30	38	
tiredness	36	47	W.	fire	57	55	
nightmares	39	39		twitching	38	39	
tunnels	12	12		habits	45	55	W.
work	41	52		cats	20	17	
drugs	30	21		wreck	52	49	
dogs	39	41					
temper	49	63	W.	Index	44.76	45.92	
business	33	27					
Self-conscious							
self-consciousness	52	75	W.	bashfulness	45	50	
clothes	53	83	W.	men	31	42	W.
blushing	29	34		sex	29	26	
queerness	31	38		longings	35	45	
marriage	38	38		moodiness	26	48	W.
impulses	22	22		immodesty	25	42	W.
women	53	10	M.	dances	30	33	
emotions	40	43		inferior	31	27	
ugliness	40	51		giggling	25	32	
stammering	24	18		nervous	16	19	
parties	31	50	W.	engagement	25	38	W.
day-dreaming	24	23		awkwardness	52	57	
manners	56	61		Index	34.52	44.60	
Hypochondriacal							
germs	58	57		pain	60	65	
heartfailure	24	19		deafness	37	33	
sickness	70	69		headache	49	56	
operation	37	49	W.	arteries	19	28	
disfigurement	50	63	W.	food	21	24	
cancer	43	51		weakness	52	53	
fainting	30	37		syphilis	51	34	M.

TABLE 4—*Continued*

	MEN	WOMEN	SIG. DIFF.		MEN	WOMEN	SIG. DIFF.
Hypochondriacal—Continued							
disease	61	51		nervousness	67	73	
smoking	36	20	M.	suffocating	55	45	
paralysis	37	41		epilepsy	27	31	
stomach	33	20		insanity	39	45	
medicine	56	41	M.				
tuberculosis	51	45		Index	43.84	43.08	
Paranoid							
injustice	67	62		rivals	45	45	
poison	33	30		voices	14	20	
enemies	47	48		teasing	31	38	
boss	31	20		employer	25	5	M.
conspiracy	37	20	M.	fault-finding	56	62	
neighbors	29	24		hypnotism	22	30	
insult	58	58		whisperings	26	43	W.
influences	20	33	W.	spirits	11	15	
sneer	40	52	W.	slight	13	8	
unfairness	60	74	W.	teacher	39	46	
persecution	30	25		inventions	19	4	M.
visions	21	19					
suspicions	49	50		Index	35.00	34.32	
machines	32	29					
Melancholic							
discouragement	64	73	W.	helplessness	36	50	W.
conscience	50	56		forgetfulness	38	50	W.
failure	68	77		worry	63	56	
religion	41	43		crying	21	31	
sin	61	57		children	21	27	
suicide	30	27		unbelief	27	38	W.
forgiveness	29	38	W.	grave	25	18	
God	90	39	M.	nervous breakdown	41	51	
ruin	37	38		confusion	90	36	M.
depression	36	49	W.	death	53	60	
loneliness	57	52					
guilt	48	56		Index	42.88	45.08	
soul	22	26					
childhood	7	14					

TABLE 5

Modal choice differences

LIST NUMBER	PRESSEY NORM	SUNNE TEACHERS	SUNNE STUDENTS	OUR DATA	
				Women	Men
			Test I		
1	disgust			sex suspicion	
4	rotting			snake	
5	insult			gutter	insult gutter
8	dirty			insanity	insanity
18	kill			kill pregnant	
21	abortion			poison	poison
			Test II		
5	worry	fright	fright		
11	beautiful	floating	floating		
21	girl			anger	
23	children	worry	worry	worry	worry
25	water	hopeless	hopeless	hopeless	hopeless
			Test III		
4	careless	reckless	fussy	reckless	reckless
12	illegitimate	dishonest	dishonest	dishonest	dishonest
16	chewing	debt	debt	shabby	shabby
18	street-walker	cruel	cruel		squealer
19	dope-fiend	swindler mistress	swindler mistress		
24	nagging	persecute	persecute nagging		boasting
			Test IV		
1	self-consciousness				discouragement injustice
2	clothes	conscience			
3	money	failure	sickness		failure

TABLE 5—*Continued*

LIST NUMBER	PRESSEY NORM	SUNNE TEACHERS	SUNNE STUDENTS	OUR DATA	
				Women	Men
		Test IV—Continued			
4	religion	falling			
7	insult	cancer		cancer	
8	God			night-mares	
9	blues	pain			pain
14	business	bashfulness		weakness	weakness
15	syphilis	windstorms		rivals	rivals
20	medicine			dances	
24	teacher	confusion	confusion	confusion	confusion
25	awkwardness	death	death	death	death

in Test I, table 1. The subject here crosses out every word he has worried or felt nervous about.

The further directions of each test instruct the student to go through the list again and encircle the word he thinks worst in each list of 5 for the 25 lists in each test. In test I he encircles in each list the word whose meaning is the most unpleasant, in Test II, the word most closely connected with the key word, in Test III, the word he considers worst, and in Test IV, the word he has worried about most. The "d" score for each test and "id" score for the entire test are determined by adding the number of deviations from the modal words.

In table 5 appear the modal words which differ from those of Pressey (1) as found by Sunne (2) and the present writers. The norms of Pressey for both men and women appear first, next those of Sunne, and third the norms as found by the writers. In cases of agreement there is no notation in the table. It will be noted that Sunne's norms are divided into teachers and students, rather than according to sexes. In table 5, the modal choice of Pressey's subjects for list 1 of Test I was *disgust;* of Sunne's Teachers, *disgust;* of Sunne's students, *disgust;* T. and R. women, *sex;* of T. and R. men, *disgust.* All other columns are read in similar fashion.

The second part of the data consists of correlations of the different variables under consideration. The coefficients were calculated according to Pearson's formula,

$$r = \frac{\Sigma xy}{N \sigma_x \sigma_y}$$

It was also thought desirable to calculate the reliability coefficients of each test, as well as for the entire test. The reliability coefficients represent data furnished by giving the tests on two different occasions.

TABLE 6

	I	II	III	IV	TOTAL
"t"	0.326±0.061	0.254±0.067	0.58 ±0.044	0.478±0.051	0.482±0.051
"d"	0.293±0.061	0.152±0.062	0.403±0.057	0.298±0.061	0.390±0.057

The total "t" score is the total affectivity score, the total "d" score is the total idiosyncrasy score.

TABLE 7

	T.A.	N	T.I.	N
(1)	0.19±0.09	47	0.147±0.093	47
(2)	0.07±0.055	145	0.169±0.053	145
(3)	0.07±0.067	100	0.610±0.068	41
(4)	0.04±0.055	145	0.08 ±0.06	129

The tests were given the first time during December, 1924, and were repeated the following March. Table 6 contains the reliability coefficients of each test with the appropriate Probable Errors. The Roman numerals used in the table refer to the separate tests of the X-O test.

Table 7 presents the coefficients of correlation between total affectivity scores and (1) psychology grades, (2) Otis Higher Examination scores, (3) Academic grades for the freshman year, and (4) Morgan's mental test. The groups vary for these data, hence the number of cases in each correlation is given after each correlation. The letters T. A. are the total affectivity

score, T. I. the total idiosyncrasy scores, the numbers in parenthesis are the variables just referred to.

Table 8 includes the coefficients using each test as a separate variable. The coefficients indicate how nearly the four tests measure the same function. The Roman numerals refer to Tests I, II, III, and IV, respectively, of the X-O test.

RESULTS AND DISCUSSION

In table 1 the following words are disliked more by the women than the men: the disgust group—wiggle, spit, rotting, worm, drunk, sneeze, vomit, smell, flesh, butcher, bladder, filthy, swamp, and pus; sex group—sex, naked, hug, breast, flirt, pox, indecent, suck, illegitimate, and tickle; the fear group

TABLE 8

Intercorrelations of the various parts of the X-O Tests

	I	II	III	IV
I		0.254	0.419	0.278*
II	0.254		0.336	0.201
III	0.419	0.336		0.432
IV	0.228	0.201	0.432	

N = 145.

—blood, spider; suspicion group—nervous, unfair, worry, loss. The men have a greater dislike for slash, roar, and tremble in the fear group; dislike and insult in the suspicion group, and leg in the disgust group. The index for each group obtained by adding the percentages and dividing by the number of words in each list (25) shows that women have decidedly more unpleasantness associated with sex words than do the men. Again the difference is rather decided among the disgust and suspicion groups. The difference is less noticeable among the fear words.

The tables in Tests II and III show rather striking differences between the sexes. The controlled associations in Test II are significant, but it is doubtful what the differences mean.

Differences in association are dependent upon the experience of the individual. It is quite evident that the experiences of men and women are decidedly different with respect to the words in Test II.

In Test III the following are considered more wrong by women than men: spitting, jealousy, suspicion, weakness, fussy, childish, sporty, blues, thief, gambler, tough, worry, coward, lazy, mean, immodest, fighting, indecent, loafing, cheating, debt, proud, chewing, cheap, smelly, meddling, squealer, street-walker, cruel, graft, mistress, scab, dopefiend, swindler, bully, strike, quitter, overeating, speculating, gossip, nagging, and overdressed. Those words considered more wrong by the men than by the women were day-dreaming, bashful, queer, easy, theater, shabby, union, trust, detective, millionaire, church-going, and cards. These differences suggest differences in moral attitudes of women and men students.

The words in Test IV are again classified into the categories suggested by Pressey. These words represent worries. Women show higher percentages for the following words in the neurotic list: noise, lightning, tiredness, temper, hysterics, and habits. The men worried more about windstorms and guns.

The self-conscious group shows that women tend to worry more about self-consciousness, clothes, ugliness, parties, men, moodiness, immodesty, and engagements, while the men worry about women more than the women do. The index, however, shows a large difference between men and women as a whole. Women feel very much more keenly than do the men.

Hypochondriacal list. The women's percentages were higher for only the words operation and disfigurement, while the men's percentages were higher for syphilis, smoking, and medicine.

Paranoid list. The women's percentages were higher for influences, sneer, unfairness, and whispering, while the men have higher percentages for conspiracy, employer, and inventions than women.

Melancholic group. The women have greater worry than men for discouragement, forgiveness, depression, and forgetfulness. The men have a greater worry for God and confusion.

The indices for the groups are not significant in favor of either sex except the self-conscious group, which shows considerably stronger emotion for the women than for the men.

Table 5 gives the list of deviations of the modal words from Pressey's first norms, those found by Sunne and our own data. The variations in Test I between the two groups of women tend to indicate that the norms for different geographical areas will vary somewhat. However in Test 2 lists 23 and 25 of Sunne's data are the same as our data. Likewise in Test III, lists 4, 12. In Test IV, list 3, the Teachers' modal choice is the same as that of the men students; list 7, Tulane teachers have the same modal choice as Purdue Women students; lists 24 and 25, the modal choices are the same in all cases, showing a decided deviation from the original norm.

It is of further interest to note the differences between the sexes. In Test I our data show the women to choose sex and suspicion an equal number of times as the mode in list I while disgust is the choice of the men. Pregnant is encircled as many times by the women as is kill in list 18. Test II shows no differences between the sexes for our data. There are differences in association between our data and Sunne's in lists 5 and 11.

In Test III our data show sex differences in lists 18 and 24, squealer and boasting respectively being the choice of the men as opposed to streetwalker and nagging for women. Further differences appear by comparing all of the data as in lists 4, 16, 18, 19, and 24. The difference in list 16 is no doubt due to geographical location as are those in lists 18 and 19.

In Test IV the men encircled injustice and discouragement equally as opposed to self-consciousness for the women. List 2 shows a difference for the teachers which does not stand out as a sex difference. In list 3 our data show *failure* to be the modal choice of the men as opposed to *money* for the women. This apparent sex difference is somewhat offset by Sunne's data in column 2. The word cancer is encircled by two groups of women in preference to insult, the choice of the men and Tulane women students. List 20 in our data shows a differ-

ence between the men and women which does not obtain in Sunne's data.

The deviations from Pressey's norms can be regarded as additions which will make them a little more stable. None of the data, however, was secured from random samples of the population in general. Hence these data are subject to sampling errors which will be of less consequence as more data are available.

In the second part of our data reliability coefficients for the test were calculated. None of the tests for the emotions have any well recognized criterion, hence the worth of any of the tests at present must be determined largely on the basis of their reliability (5). The reliability coefficient for the total affectivity scores is 0.482 and the reliability coefficients for the idiosyncrasy scores is 0.39 as shown in table 6. The reliability coefficients for the separate tests show Tests I, III, and IV as the most promising. However, the coefficients are not large enough to afford a sound basis for prediction. The data in table 7 show that neither the total affectivity scores nor the idiosyncrasy scores correlate to any extent with Psychology grades, the Otis test, average of all grades, or the Morgan test. The prediction of scholarship is not significantly increased by combining the X-O test with either of the intelligence tests.

Pressey (1) and Chambers (4) have found the *net differential score* to be of value in predicting scholarship. In his first report Pressey mentions the fact that the total affectivity and idiosyncrasy scores were of no value for predicting scholarship. Our data bear out this fact. From the first data Pressey obtained a coefficient of correlation of 0.58 between the net differential score and average grades. The number of subjects was small so the result can not be considered stable. At the time, however, the test looked very promising as the coefficient of correlation reported by Pressey between Grades and Alpha scores was 0.35 and 0.37. There have been no calculations of the reliability coefficient for the "net differential" score. Its reliability can not be inferred to be low, however, because of the low reliabilities of both the total affectivity and idiosyn-

crasy scores. The value of the test for the prediction of scholarship is to be found in the net differential score.

Chambers, in reporting experiments with Form B of the test has secured coefficients similar to those earlier reported by Pressey by using the "Net differential score." However, in a group of 57 the coefficients were as follows:

Grades *versus* X-O scores	0.46
Grades *versus* Intelligence	0.53
X-O *versus* Intelligence	0.51

Little can be gained by combining the two tests in predicting scholarship as Chambers shows.

There is nevertheless something to be said for the test. It shows individual differences and sex differences in a very striking manner. As an instrument for delving into complexes it is very suggestive and valuable. There are ever so many very interesting leads for further investigation. It does not seem unfair to say that the test should be revised on the basis of the net differential scores, since the two scores now used are of little value.

Tests of the Emotions and the non-intellectual functions are difficult to construct because of unsatisfactory criteria. It appears that a method similar to that employed in building intelligence tests would be most fruitful. Emotions probably change, unfold, and become more complex as do the intellectual functions. There is at least no evidence to the contrary.

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THE DISTRIBUTION OF "ATTENTION" AND ITS TESTING[1]

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The attempt is made in the following investigation to distinguish between various types of distribution of "attention" significant for vocational testing, to demonstrate individual differences in such distribution, and to see if there are any indications of a relationship between the total performance in a task requiring a distribution of "attention" and the degree of distribution itself. This investigation further illustrates a few general facts, such as: (*a*) that the utmost precaution is necessary in accepting vocational psychological apparatus at face value even if it can boast an extensive use, so that only an accessible careful psychological investigation of it can justify its adoption; (*b*) that the introspective method is a valuable aid in examining and selecting self-constructed or adopted vocational psychological tests; and (*c*) that seemingly slight or mechanical alterations in the apparatus may produce a total change in what the subject experiences and consequently in what mental quality is actually tested.

The "Attention- and Fatigue-meter" according to Piorkowski[2] was used. Several applied psychologists in the United

[1] My sincere thanks are due to Professor Krueger for permitting me to carry on this investigation in the Leipzig psychological laboratory in 1926, as well as to Professor Klemm for so kindly providing me with everything needed.

[2] The apparatus is made by the "Organizations-Institut" Dr. Piorkowski, Berlin, and E. Zimmermann, Leipzig. No publication could be found containing an attempt to prove the claim for, and justify the use of, the apparatus as providing a reliable test for the qualities in question.

States have lately shown interest in this piece of German apparatus, which is not only found in the psychological laboratories of German universities but is in everyday use for testing the distribution of attention in vocational guidance institutes, among others in the Landesberufsamt, Berlin, and the Berufsberatungsstelle, Leipzig. The apparatus consists of a rectangular box with a row of ten openings in the top and a reaction button opposite each opening. White strips can be made to

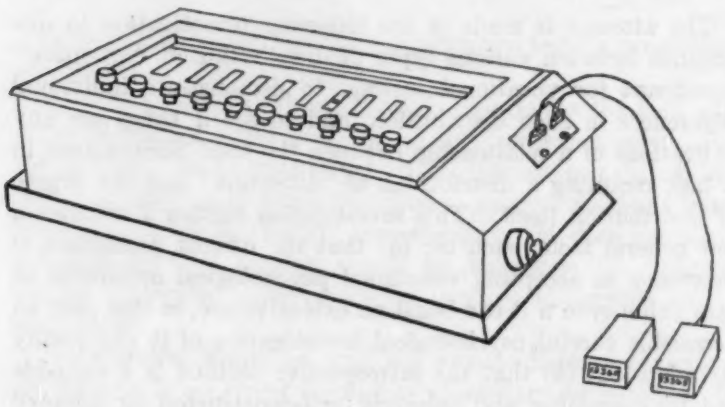

FIG. 1

appear at irregular intervals in the various openings by causing a black cylinder, on which the strips are pasted, to rotate in the box by means of a motor. The O is directed to react as soon as a strip is seen by pressing the button corresponding to the opening in which it appears. Two electric counters are attached —one to register the total number of strips appearing, and the other to register the total number correctly reacted upon in time by the O with the ten buttons (see fig. 1). The sum of the correct reactions, as thus registered during a period of several minutes, is then taken as a measure of the distribution of the O's attention over this field fit for comparison with the per-

formances of other O's, and hence as fit for serving as a general indication of the O's distribution of attention.[3]

There are, however, several suppositions on which this assumption is based and these demand investigation, viz.: (1) that it is indeed a distribution of *attention* (in the sense of a clear consciousness of each of the white strips in the various portions of the visual field), which is responsible for the score obtained by the O; (2) that the complex reaction does not itself cause any difficulties and influence the score noticeably (since it is regarded merely as a means of registering the attention paid and its distribution); (3) either that the correct reactions are always spread evenly over the ten buttons, or else that there is a high positive correlation between the height of total performance, as measured by one counter, and the actual *degree* of distribution—otherwise the total number of correct reactions would not provide a means for comparing O's with regard to their capability for carrying out a task demanding a "distribution of attention."

These suppositions were subjected to an experimental investigation. For this purpose the apparatus was slightly altered, namely, by attaching ten electric counters to register the correct reactions at each of the ten openings separately. Thus the evenness of the distribution over the whole field could be better checked. An eleventh counter registered as before the total number of strips actually appearing in the ten openings. It was then possible to calculate the percentage of correct reactions for each opening since the number of strips appearing in each remained constant when 100 or 200 strips appeared altogether.

Twenty-five O's were tested with the strips appearing at the rate of 100 per minute. Each O was first given the opportunity of becoming accustomed to the apparatus and the performance

[3] The O usually has to fulfil his task for about 30 minutes on end and readings are taken at regular intervals. The extent of the decrease in the total number of correct reactions for each of these successive periods is taken as an indication of the liability to fatigue of the O as compared with other O's.

of the task. After a short interval he had to commence reacting and had to continue for 25 to 30 minutes without a pause.[4] The counters were switched off for half a minute after regular two-minute periods without allowing the O to notice it, and readings rapidly taken. The performances during the first or first two periods had to be taken as indicating the distribution of the O's attention. A general introspective report on the manner in which he carried out his task was given by the O after completion of the experiment. During the experimental period the E also made a note of observations on the O's method of performance. These reports supplemented by the E's observations provide the material for discussing the first two suppositions mentioned, while the third supposition can be examined by means of the percentages of correct reactions obtained separately for the various parts of the visual field.

According to introspection the O's were fairly clearly conscious of the task at the beginning of the preliminary period of practising. Besides this they realized that they were concentrating on the visual field and the reactions, recognized each strip as it appeared and thought about where they had to react. This must be looked upon not as an enumeration of a number of contents of consciousness separately present, but as a partial description by means of abstractions of a unitary state of consciousness. Such descriptions certainly seem to justify the assumption that one really has to do with a distribution of *attention*. After a short, often extremely short, time, however, the O's reacted almost automatically according to their introspective reports. The state of consciousness had totally changed: the unity—task, realization of concentration, recognition of strips and thoughts on each reaction, etc.— was no longer in the center of consciousness. The O's said that after a short time they just kept their eyes fixed on the openings and that the reactions then simply followed as soon as the strips appeared in spite of the fact that very often they were thinking of altogether different matters. Indeed, most of the O's

[4] This length of time was necessary to investigate the testing of fatigue by means of this apparatus.

already mentioned this of their own accord in the course of the experiment. This absence of attention was only noticed by the O's now and then, when the former state of consciousness again returned for a little while. In other cases, however, the O sometimes only became casually aware of the fact that he was fulfilling his task unreflectingly, or just had a vague and passing impression that he was occupied. During the greater part of the experimental period therefore, the reactions followed the stimuli without the O's realizing that they had seen the strips and had performed their task. The following extract from the introspective report of one of the O's illustrates this:

> I was not conscious of any mental effort. It just seemed to me as if I was engaged on a physical performance, on a following up of stimuli with speed as the important factor. Shortly after commencement I noticed that my fingers moved up and down of their own accord as soon as the strips appeared. At the same time I became conscious that I had been thinking of altogether different matters. . . . . Although I knew that the same strips would reappear after a while, no recurring sequences became clear to me. I was continually thinking of other things but at the same time had the impression that my task was being performed quite satisfactorily.

The second is then the real state of consciousness during the greater portion of the experiment. This "inattention" which all the O's emphasize did not however, affect the performances unfavorably since improvement could be observed in the case of 20 of the O's. Furthermore the registered scores of correct reactions showed that even when reactions took place automatically certain differences existed between O's as to the evenness of their performances (see figs. 2 and 3). Consequently an O's performance can at the most be regarded as an indication of his ability to carry out a number of actions automatically in connection with optical stimuli which are present without necessarily being in the foreground of consciousness. It would not be desirable to speak of a test of "attention" or the distribution of "attention" in such a case where the stimuli and the reaction-task are not in the center of consciousness during the greater part of the experiment. The

terms "marginal consciousness" and "distribution of marginal consciousness" can hence be used to designate such a condition where the results of stimulation do not reach the foreground of consciousness but yet exert an influence.

Since individual differences between O's, which will be described in more detail later, were found in this experiment it may be important for vocational guidance purposes to have a test for automatic activity in connection with a distribution of marginal consciousness. In fact there are machines which demand that certain simple manipulations follow definite occurrences for the satisfactory performance of which it is not essential that there be more than a marginal consciousness of the occurrence and automatic acting. Sometimes indeed the manipulation may be so very simple as to be negligible, so that a test of the "distribution of marginal consciousness" alone becomes desirable. The fact that in the test under investigation, however, one is not solely concerned with a testing of the marginal consciousness of the optical stimuli, but also of action in connection with such consciousness, is emphasized because individual differences in the manner of reacting as well as in the distribution of the marginal consciousness influence the result. So, for example, precision of movement is an advantage to O's; slight ability for automatic action on the contrary a disadvantage. Besides this several O's who required a long reaction-time with simple reaction experiments stated that they found reacting in carrying out this experiment difficult, although they knew quite definitely that they had noticed every strip as soon as it appeared. It is true that the duration of the period available for reaction is considerably greater than the normal reaction-time of an O in a simple reaction experiment. Nevertheless, it must be taken into consideration that in this experiment a great number of stimuli appear in fairly rapid succession and that therefore the resistances against a complex reaction can become very strong. This would of course also be the case in handling machines which demand similar psycho-physical qualities, so that it is essential to eliminate this type of inefficient person.

The test can therefore be looked upon as one of a "distribution of marginal consciousness and automatic acting" and not as a test of a "distribution of attention" or of just a "distribution of marginal consciousness."

The points raised in the third supposition next demand treatment. Figures 2 and 3 show for a number of cases the

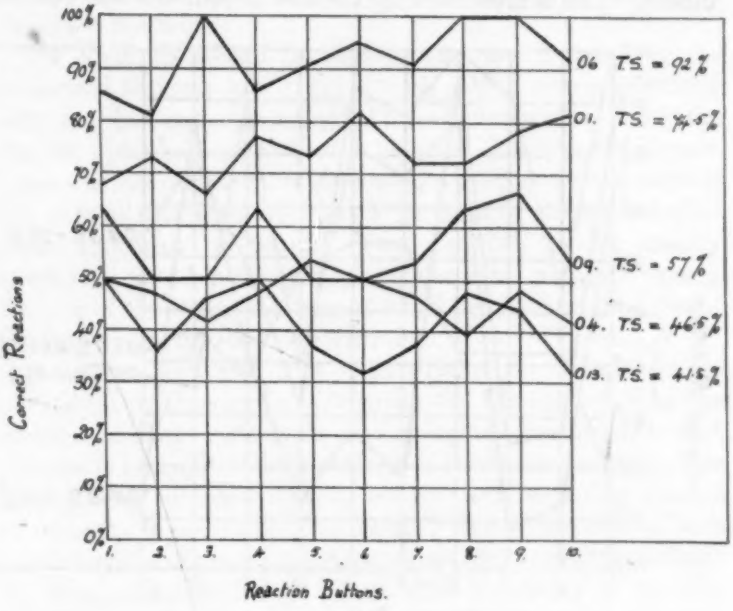

FIG. 2

O = observer; T.S. = total score

distribution of the scores for the ten openings in terms of the percentages of correct reactions. Only five O's showed an even performance, i.e., if a performance can be looked upon as even when the standard deviation calculated on the basis of these percentages does not exceed 10 (see fig. 2). The performances of the great majority of O's were however more or less uneven and some of these are represented in figure 3.

The objective registrations prove that individual differences exist between O's in so far as some react evenly and others unevenly. These are as was pointed out individual differences in the "distribution of marginal consciousness and automatic acting." In some cases certain portions of the visual and of the reaction fields were given preference to the disadvantage of others. This is illustrated by the case of four O's who reacted

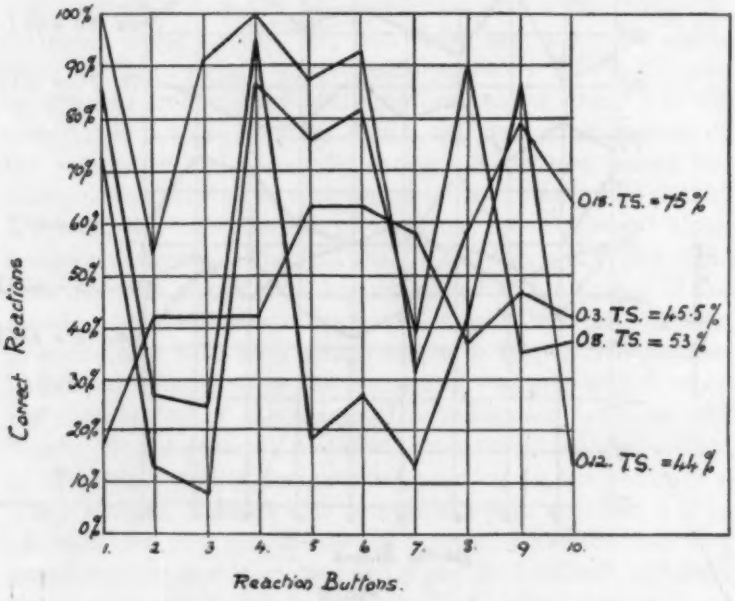

FIG. 3

with the left hand on only one (or sometimes two) of the left buttons, and attempted to manage the remainder with their right hand. One of them was O 8 (fig. 3), and the result can easily be seen in the curve. Such a method influences not only the reaction itself but also results in a restriction of the field over which the marginal consciousness is distributed. O 8 in fact stated this. He believed that he had very seldom noticed the strips far towards the right.

The O's do not, however, only differ in that some show an even and others an uneven "distribution of marginal consciousness and automatic acting." They also attain different general levels of performance both in the case of even and uneven distributions. Besides this the *degree* of uneven distribution varies in the case of different O's. These facts can also be seen from figures 2 and 3. Consequently a ranking of the O's is desirable.

For some vocational psychology purposes it may only be important to know how many stimuli spread over a relatively extensive field enter the marginal consciousness of an O and are reacted upon by him, *without* it being of fundamental importance whether or not he becomes marginally conscious of more of the stimuli appearing on certain portions of the field than of those appearing on others. Two counters, as are usually employed, would suffice for testing for such purposes since a ranking of the O's in this respect could be made on the basis of the total scores for their performances.

More often, however, it is of importance for the purpose of vocational psychology to distinguish the O's according to the *evenness* in their "distribution of marginal consciousness and automatic acting." Can a ranking of the O's according to this quality also be based directly on the total scores of correct reactions? It is evident from figure 2 that in the case of *even* "distributions of marginal consciousness and automatic acting" the total scores do indeed permit such a ranking of the O's. A comparison between figures 2 and 3 shows however, that this is not possible when all the O's are to be taken into consideration, as is naturally the case. Such a ranking of all the O's would only have been possible if one of the alternatives in the third supposition (page 497) were true, viz., (*a*) that there is an even "distribution of marginal consciousness and automatic acting" in the case of all the O's; or (*b*) that the total scores are always highest in the cases of even distribution and decrease as the distribution becomes more and more uneven. Figure 3 proves that (*a*) is not true.

The alternative (*b*) is however no less false. O's (such as

6 in fig. 2) who reach a very high total score (over 90 per cent) will indeed necessarily show an even distribution, and hence head the list on both accounts. Apart from these relatively isolated cases (one only in this experiment), it is impossible to judge the evenness of the "distribution of marginal consciousness and automatic acting" from the total scores. O's with a clearly less even distribution, e.g., often attain a higher total score than, or an equally high one as, others with an even distribution. Compare in figures 2 and 3: O 1 with O 18; O 4 with O 8; and O 13 with O 12. Furthermore, O's with a more uneven distribution often attain a total score as good as, or even better than, that of others with a less uneven distribution. (Here the standard deviations for the percentages of correct reactions at each of the ten openings are taken as a measure of the degree of unevenness of distribution.) Compare in diagram 2: O 3 (σ = 12.5) with O 8 (σ = 29.4) and O 12 (σ = 31.2). A further fact supporting the contention that alternative (*b*) is not true, is that $r = 0$ (Bravais-Pearson formula) for the total scores correlated with the standard deviations. Since the number of O's were relatively small this does not prove but certainly does indicate that there is very little or no correlation between the total performance in a task requiring a "distribution of marginal consciousness and automatic acting" and the degree of evenness or unevenness of the distribution itself.

Conclusions concerning an individual's "distribution of marginal consciousness and automatic acting" can therefore only be drawn from a graph obtained in the above manner, or from the standard deviation of the percentages of his correct reactions at each of the openings.

There are, however, occupations for which a distribution of another kind is essential, viz., where the worker must constantly be clearly conscious of what occurs within a somewhat extended field. Here one can speak of a "distribution of attention."

Simple alterations in the apparatus used made it serviceable for also testing O's with regard to such distribution of attention.

It was so arranged that the O had to react on the fourth button with the left hand when a strip appeared in any one of the five openings on the left, and on the seventh button with the right hand when a strip appeared in any one of the five openings on the right. A white line between the fifth and sixth openings helped to distinguish right and left. The O's were asked to hold a finger of each hand in position above the button in question so that they would constantly be prepared for reaction. After each reaction they had to release the button immediately. The enforcement of this rule was carefully guarded by the E from the very commencement since the habit to hold down the button till it should be necessary to react upon the following stimulus could easily be acquired. This would however have led to the registration as correct reactions of strips appearing in one of the corresponding five openings, which might otherwise have passed unnoticed or have been noticed too late. The correct reactions were again registered separately for each opening by means of ten counters.[5] Fifteen O's were tested with the altered arrangement. Each one reacted 15 to 25 minutes.[6] One hundred strips appeared each $\frac{3}{4}$ minute. Five of the O's had also been tested according to the former method in order to obtain comparisons of the two methods from them to supplement the introspective reports of the O's who were only tested in one way.

[5] The purpose of the experiment is best achieved if the sequence of the strips satisfy the following demands. Left and right reactions must alternate irregularly to assist in preventing rhythmical movements of the hands. A possible variation, which can be repeated a few times, is the simultaneous appearance of a strip on each side. This introduces not only a further simple aid towards avoiding rhythmical reaction, but also a means of including the testing of simultaneous distribution of attention. Furthermore, the intervals of time between the appearances of the stimuli should not be equal or vary rhythmically. The strips must, however, be so arranged that the number passing each opening always remains constant when a certain total has been registered by means of a single counter, so that the possible number of correct reactions for each opening can always be deduced from this total.

[6] The effects of fatigue on the distribution of attention will be treated in another article.

The alteration proved to be effective, for according to introspection the state of consciousness of the O's during the performance of this task differed totally from that during the former test. Not only did they have to become fully conscious of each of the stimuli at the commencement in order to react correctly, but also later when they already knew to some extent in what sequence the stimuli would appear. They could only turn this knowledge to account when the stimuli came into the foreground of consciousness, but became confused as soon as they thought of other matters. Inevitably some time then passed before they once more found their way with the task. To do this they again had to concentrate fully on the stimuli. In this way the distractions always influenced the registered results. The concentration on the visual field, the consciousness of the optical stimuli and decisions as to how to react did not disappear as before without detracting from the value of the performance, but had to be present continually for the O to achieve any success. Failures to react were not in this case the direct result of the simple reaction movements to such an extent that special notice need be taken of the latter. The numerical data seem therefore to provide an indication as to how far a "distribution of attention" can be expected from an O.

The following introspective report to which most of the others are similar is given for the purpose of comparison with the one previously cited.

> I had to attend to my task incessantly and could not allow my attention to be distracted. If this did happen occasionally I immediately became confused and my reaction was unsatisfactory. After some time I noticed certain sequences of strips. I could, however, only avail myself of such observations if I devoted myself with full attention to my task. I could not react automatically upon strips appearing on the right or left side. The reaction itself did not seem to me to be connected with a certain stimulus or kind of stimulus (viz., a left or a right one), but the same kind of reaction (i.e., on a left or right button) seemed to me to follow totally different stimuli—even though these did possess the common characteristic of appearing right or left.

Perhaps it might be supposed that a distribution of attention was obtained in the second experiment in contrast to a distribu-

tion of marginal consciousness in the first as a result of the slightly increased rapidity in the succession of the strips. That this was not so was proved by five O's carrying out the complex reaction experiment at the same slightly increased rate. Their introspective reports were in full agreement with those of the O's who reacted at the slower rate. Naturally their numbers of correct reactions were lower.

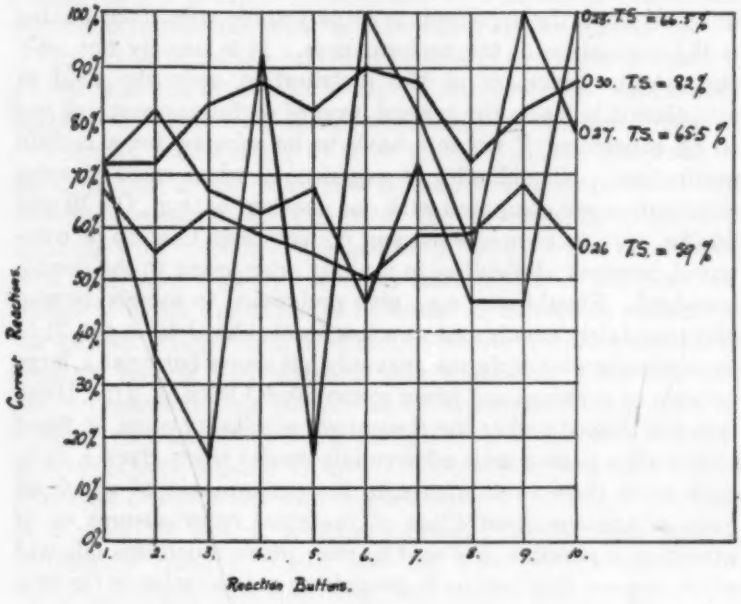

FIG. 4

The curves in figure 4 show how O's differ in their distribution of attention. O's 26 and 30 were the only ones among the fifteen O's showing an evenly distributed attention. O's 27 and 28 are examples of uneven distributions. O 27 would have to be ranked higher than O 26 if only the total performance scores were to be taken into consideration. Undoubtedly, however, the latter must be acknowledged as the better when only the evenness of the distribution of attention is of importance. O 27

has almost the same total score as O 28 although the latter's distribution is less uneven than that of the former. These cases show that what was emphasized in connection with the distribution of marginal consciousness and automatic acting also holds true for the altered method, namely, that no conclusions on the distribution (in this case of attention) can be drawn from the total scores.

A difficulty which may not be overlooked if the ten counters are used when the apparatus is employed for vocational testing is the evaluation of the performances. It is namely not only the relative evenness of the distribution over the field of stimulation but also the general level of performance which has to be considered if workers have to be selected for a certain occupation. No difficulty is experienced when cases of even distribution are compared with one another, as, e.g., O's 30 and 26 (fig. 4). As soon as even and uneven cases have to be compared, however, difficulties in ranking arise owing to the double standard. Should one, e.g., give preference to somebody who performs fairly evenly but at a low level (like O 13 in fig. 2) to someone else who performs unevenly but scores better at a large number of openings and never worse (like O 18 in fig. 3)? If the latter is ranked higher the theoretical possibility must be faced that such a person may achieve fair results when given a task, such as in these experiments, in the performance of which an even *or* uneven distribution of marginal consciousness or of attention is possible, but that he may prove much less efficient when an even distribution is *compulsory* as is sometimes the case in the handling of machinery. It is also difficult to evaluate on this double basis a performance which is uneven and, although usually higher than another performance, is yet lower for some portions of the field. (Compare O's 26 and 27 in figure 4.)

Several attempts to arrive at an objective method of evaluating, combining the general level of performance and the degree of distribution—with the emphasis on the latter—led to the conclusion that for the present evaluation would only be feasible on the basis of a comparison of curves arrived at as above. This will not, however, be a simple matter. At any rate it will

be necessary to determine empirically below which level a performance may never sink, whether it be a whole even performance or only one portion of an uneven one. Similarly it should be determined what degree of unevenness is too large for an O to be regarded as trustworthy in spite of the fact that his performance never sinks below such a critical level. For such purposes a comparison is necessary between the test performances of a group of workers and their achievements in the particular occupation for which the test is to be adopted.

The similarity of the curves in figs 2 and 3 to those in figure 4 proves that the curves alone do not enable one to realize how different the states of consciousness are in the two types of experiment. This seems to show that the mental processes of an O during a test may not be deduced directly from the objective registrations but that the latter only acquire a meaning with respect to the mental processes when these have been laid bare, e.g., by means of introspection. So, e.g., the curves in figure 4 could only be taken as indicating various of the kinds of distribution of attention of the O's after the introspective reports had revealed that a state of attention was really present during the course of experimentation. Consequently vocational psychologists who do not wish to make use of tests merely because of their correlation with a more or less imperfect criterion but who desire to have a test which they can look upon as testing a certain definite and known mental attitude or quality, should use the introspective method to investigate their tests more than is at present being done. It is often extremely misleading to interpret the objective data simply on the basis of an impression or according to the purpose set in constructing the test.

Apart from providing an illustration of the few general facts mentioned in the first paragraph, this study yields the following results.

1. The vocational psychologist should distinguish between the distribution of "marginal consciousness," of "marginal consciousness and automatic acting" and of "attention," and

should test for them by means of different methods. Each of the types of distribution are of importance for different occupations.

2. O's differ not only with regard to the total height of their performance, where a distribution of marginal consciousness and automatic acting or of attention is necessary, but also in respect to the evenness or degree of unevenness of the distribution.

3. There are very strong indications that there is no correlation between the total performance in a task requiring a distribution of marginal consciousness and automatic acting, and the degree (i.e., the evenness or unevenness) of the distribution itself. The same seems to be true for the distribution of attention.

4. None of the investigated suppositions underlying the use in its original form of the "attention- and Fatigue-meter" of Piorkowski as a test for the distribution of attention were found to be justified. Alterations can, however, be made in the apparatus to enable one to test the distribution of marginal consciousness and automatic acting, or the distribution of attention. In both cases difficulties in evaluating would have to be faced since for practical purposes both the evenness and the general level of performance would have to be taken into account thus forming a double basis for comparison.

A STUDY OF THE INTELLIGENCE AND ACHIEVEMENT OF FULL-BLOOD INDIANS[1]

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University of Denver

A study of racial differences in mental traits is of necessity a study of native differences or differences due to heredity in ethnic groups. But since it is practically impossible to catch nature and measure its effects before nurture has set in with its modifying influences, the scientist working in the field of racial psychology must control this factor of nurture. So far all studies in racial mental differences show if any, not differences in mental nature but of nature plus nurture because the latter factor has not been successfully controlled and measured so that its measured effects could be subtracted from the racial measures obtained.

The present study is an attempt to measure intelligence as influenced by factors of nurture in the case of one thousand full-blood Indians. It is understood that all the measures exhaust neither the factors of intelligence nor of nurture, but that such phases are measured as a standard instrument is able to reach, along with other indicated measures.

THE SUBJECTS

The subjects in this experiment are full-blood Indians a little over half of whom were found in the United States Indian Schools of Oklahoma and South Dakota, the remainder coming from Church schools and a few from public schools of Oklahoma. The test used in this study was the Otis Classification Test

[1] Paper read before Section Q, American Association for the Advancement of Science at the meeting at Nashville, Tennessee, December 28th, 1927.

which measures Educational Achievement and Intelligence, Part I of the test measuring the former and Part II the latter.

PROBLEM

The problem here is first to note in a superficial fashion the change in chronological, mental and educational age with school

TABLE 1

Showing composition of group of 1000 full-blood Indians; chronological, mental, and educational ages; IQ, and accomplishment ratio in medians for each school grade

	GRADE						TOTAL
	4	5	6	7	8	9	
Number	274	220	160	114	114	33	1,000
C.A. Med. Yr.	12.9	13.8	16.2	17.0	17.5	17.9	
Q	1.4	1.8	2.0	1.3	1.3	1.3	
M.A Med. Yr.	8.2	8.9	9.7	10.6	11.5	11.6	
Q	1.1	1.0	0.9	1.3	1.6	2.1	
E.A. Med. Yr.	9.0	9.8	10.4	11.9	12.5	13.2	
Q	0.6	0.7	0.4	0.6	0.9	2.3	
IQ Med.	67.3	66.6	67.6	73.2	81.5	81.0	70.4
Q	11.6	7.2	6.7	8.7	4.2	11.4	10.9
A.R. Med.	105.3	107.7	108.2	111.9	109.3	107.3	107.4
Q	2.9	6.8	2.1	8.1	9.5	6.9	3.4

The overlapping of Full-Blood A. R. on White Median A.R. is 79 per cent.

grade, and likewise the intelligence quotient and accomplishment quotient for the grade. The thing of next and greater importance is the IQ for the group and the accomplishment ratio for the group. The third very important problem is to ascertain by means of the method of correlation the effect of the measured factors of nurture on the intelligence score.

HANDLING THE DATA AND RESULTS

Table 1 shows the composition of group with reference to school grade. The test scores were expressed as mental and educational ages. These are also found in table 1. Likewise are to be found the IQ's and A.R.'s for grades and for totals. Figure 1 presents the facts of the table in connection with the school grades. It will be seen on referring to the table and the figure that the chronological age increases with the school grade,

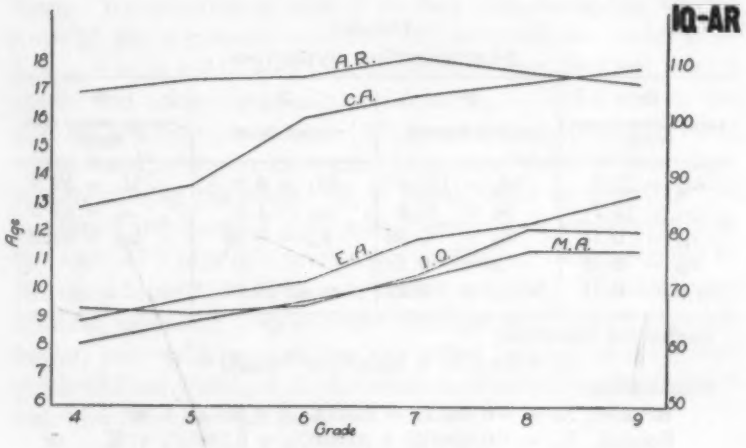

FIG. 1

likewise the mental and educational ages. The disparity between chronological and mental age is seen to be considerable from grade to grade and it will be noted that the educational age is slightly better for a grade than the mental age. It will be noted upon examination further of the table and figure that the IQ changes somewhat with grade but not regularly. On the whole the IQ for the group is found to be 70.4 and the A.R. for the group is 107.4. The latter measure is the ratio found existing between the educational quotient and the intelligence quotient when the former is divided by the latter.

The IQ here obtained is about what has been obtained for full-blood Indians by Garth et al. with the National Intelligence Test, i.e., 68.7 (1). The A. R. is here found to be quite high. In fact it is higher than for the Whites. The overlapping of the Indian distribution on a norm for Whites is 79 per cent. Authorities differ as to the meaning of the accomplishment ratio but some think it is to be regarded as a measure of effort. If this be true these results would show that these full-blood Indians put forth more effort than do Whites.

TABLE 2

Showing various correlations

(1) INTELLIGENCE TEST SCORE	(2) AGE IN MONTHS	(3) SCHOOL GRADE	(4) ACHIEVEMENT TEST SCORE
$M_1 = 22.8$	$M_2 = 185.4$	$M_3 = 6.2$	$M_4 = 32.9$
$\sigma_1 = 13.7$	$\sigma_2 = 32.6$	$\sigma_3 = 1.5$	$\sigma_4 = 17.9$
$r_{12} = 0.14$	$r_{23} = 0.58$	$r_{14} = 0.83$	$r_{34} = 0.69$
$r_{13} = 0.61$	$r_{24} = 0.18$		
$r_{12.34} = -0.11$	$r_{13.24} = 0.22$	$r_{14.23} = 0.67$	

Regression Equation:

$$X_1 = b_{12.34}X_2 + b_{13.24}X_3 + b_{14.23}X_4 + K$$

Substitution:

Regular, $X_1 = -0.033X_2 + 2.034X_3 + 0.507X_4 + K$

Special, $X_1 = -0.8283X_2 + 2.0856X_3 + 6.7405X_4 + K$ or

$X_1 = -1X_2 + 2.5X_3 + 8.15X_4 + K$

$\sigma_{(est.\ X_1)} = 7.51$

P.E. $_{(est.\ X_1)} = 5.065$

$R_{1(234)} = 0.836$

In an effort to find out the influence of such factors as age, grade placement, and educational achievement, as measured by the test, upon intelligence of full-blood Indians as measured, we have had recourse to the method of partial correlation with the corresponding regression equation. See table 2.

Calling Intelligence Test Score (1), Age (2), School Grade (3), and Achievement Score (4); we find $r_{12.34}$ to be -0.11; $r_{13.24}$ is 0.22 $r_{14.23}$ is 0.67. It will be seen that if school grade and achievement are held constant the correlation between test

score in intelligence and age is negative, and small at that, in fact it is negligible, it being − 0.11. If we hold achievement and age constant again the correlation is only slight, 0.22. But if we take intelligence and achievement scores and hold age and school grade constant the coefficient of partial correlation is seen to be 0.67. That is, the greatest influence on intelligence score is education and it is greater than any of the other factors. It would now be well to determine the combined effect of age, school grade and achievement on the intelligence score. By referring to table 2 we find that, using the special form of the regression equation (2), in which we make $\sigma = \sigma_2 = \sigma_3 = \sigma_4$, it will be seen that the relative weights of age, school grade, and achievement are, respectively, − 1, 2.5 and 8, the first being a minus quantity. While school grade is important, educational achievement is more than three times as important in determining the score. It is worth while to ascertain the combined influence of age, school grade and achievement in the form of a multiple correlation coefficient. On referring to the same table 2 it will be seen that it is 0.836. This high correlation, especially if we consider that age is a slightly negative factor, leaves little room for any other factor besides school grade and achievement in education in determining intelligence score for full-blood Indians.

SUMMARY

1. The mental age of these full-blood Indians is for a grade much lower than the chronological age for that grade.

2. The educational age is found to be higher for a grade than the mental age.

3. IQ is inclined to rise for the grade, but irregularly.

4. The median IQ for the group is about what has been previously found for full-blood Indians with the National Intelligence Test, i.e., 70 as against 68 for the latter.

5. The accomplishment ratio for these full-blood Indians is higher than that for Whites. The overlapping is 79 per cent.

6. Educational achievement is a stronger factor in determin-

ing intelligence score than grade placement, the relative weights being 8 and 2.5 respectively.

7. Age is if anything a negative factor in determining intelligence score. In fact it is a negligible factor.

8. Since the combined factors of age, school grade placement, and educational achievement have such a high influence on intelligence score for full-blood Indians and age is only slightly negative, these educational factors leave little room for anything else. If we consider school grade placement as merely environmental still educational achievement is much stronger.

REFERENCES

(1) GARTH, THOS. R., ASSISTED BY SERAFINI, T. J., AND DUTTON, DEWEY: The Intelligence of Full-Blood Indians. Jour. Applied Psy., 1925, ix, 4, 382–389.

(2) GARRETT, HENRY E.: Statistics in Psychology and Education, p. 173f.

FACTORS AFFECTING THE SUCCESS OF COLLEGE FRESHMEN[1]

ROBERT M. BEAR

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The studies presented in this paper arose out of questions asked by members of a class doing work in educational statistics at Centre College. It was asked whether there were any relationships between mental ability and academic grades of students and a number of variable factors, such as their fathers' occupations, their vocational purpose as shown in the courses elected, their participation or non-participation in athletics, the section of the country from which they came, and their age.

The suggestion was made that the class might find some light on the answers by making studies of the freshmen on each of these points, keeping in mind, however, the fact that no conclusive inferences could be drawn because of the limited number of cases. This suggestion was received rather enthusiastically by members of the class, and the instructor was glad to take advantage of the opportunity afforded to supervise the application of their statistical training to this real rather than to imaginary laboratory material.

The results proved interesting. Hence, for this paper the study was extended to include the freshmen, one hundred and seventy-two in all, of the two entering classes for the sessions beginning 1925 and 1926 respectively. Scores for mental tests given the freshmen at the opening of each session and the final academic grades for the first semester of each year were available. Scores from only one of the intelligence tests were used,

[1] A paper read before the Philosophy and Psychology Section of the Kentucky Academy of Science, May 7, 1927.

the Otis Higher Examination of Mental Ability, Form B being given in 1925 and Form A in 1926. To render the results of the two forms comparable, four points were added to the value of each Form B paper, according to the correction given by the author in the Manual of Directions.

The academic rating of a student was secured by finding the arithmetic mean or average for the final marks he received in each subject at the end of the first semester. These average grades were arranged in frequency tables and the median grade computed for the various groups studied. Our information as to father's occupations, the course the student expects to enter for his major, and his age are indicated by him when he is matriculating.

As a check on the variability of the measures, quartile deviations were found for each median, and from these the probable error was calculated by substitution in the formula, P.E. $= \frac{5\ Q}{4\ \sqrt{n}}$. An examination of these P.E.'s given in the tables, will show them to be in many cases large. If instead of regarding the probable error as a measure of variability, it be used as is more commonly done as a gauge of reliability we are able to predict the extent the median scores of additional samples would differ from those found for the groups studied. Or reliability can be measured by finding the ratio of the probable error to the difference between the scores of any two groups. In the case of the median academic averages of farmers and professionals of table 1, the ratio found by dividing the difference between the two scores by the square root of the sum of the squares of the probable errors of each is 1.06. In the case of the median academic averages of the pre-medical and pre-engineering groups of table 2 the ratio is 2.88; while for the athletes and non-athletes of table 3 it is 3.72. In most cases the reliability is seen not to be very high and further studies of additional groups of students are necessary. Although this is true because of the limited number of cases used in this paper, it is presented for what it is worth as being the findings for this particular lot of freshmen.

In table 1 is found a comparison of the intelligence and academic standing of students and the occupations of their fathers. The various parental vocations may be classified under the six headings shown. Almost twice as many boys are from homes of business executives as from homes of farmers or from professional homes. Most of the nineteen sons of salesmen have

TABLE 1

Comparison of fathers' occupations and ability and achievements of sons

OCCUPATION OF FATHER	NUMBER	MEDIAN SCORE ON OTIS TEST	P.E.	MEDIAN ACADEMIC AVERAGE	P.E.
Farmer	33	43.21	1.27	72.50	1.84
Professional	27	49.58	2.15	75.36	1.93
Salesman	19	56.07	1.21	75.50	1.93
Skilled artisan	9	52.50	2.27	76.25	2.72
Business executive	60	45.62	1.07	72.72	1.36
Business employee	12	49.98	2.70	70.00	3.38
Unaccounted for	12	45.00	2.70	75.00	1.57

TABLE 2

Comparison of the students in the five courses

COURSE	NUMBER	MEDIAN SCORE ON OTIS TEST	P.E.	MEDIAN ACADEMIC AVERAGE	P.E.
General	80	46.66	0.87	72.33	1.14
Teaching	7	57.50	3.98	82.50	5.48
Pre-medical	18	45.00	2.64	70.00	3.45
Pre-engineering	21	48.92	1.19	77.08	2.00
Business administrative	46	48.12	1.85	73.75	1.13

fathers who sell either automobiles or insurance. In the group labelled "unaccounted for" are cases in which the father was dead or had retired or about whom information was lacking.

Examination of the mental and academic ranking of the groups shows that sons of salesmen and those of skilled artisans hold alternate first and second places. Sons of business em-

ployees, chiefly clerks, rank third mentally but last in scholastic grades, thus failing to work up to their capacity. Farmers' sons are lowest in ability and next to last in academic achievement. The high standing of the skilled artisans may be partially explained on the basis of selection. For example, the boy who made the highest intelligence score for the two years is the son of a printer.

Table 2 shows the results of classifying the freshmen according to the course in which they expect to major, of which there are five. Almost half of the men intend majoring in the general academic course. Business administration is the next most popular course. More men major in the general course with education as their leading subject than major in the teaching

TABLE 3

Comparison of athletes with non-athletes and with the class

GROUP	NUMBER	MEDIAN SCORE ON OTIS TEST	P.E.	MEDIAN ACADEMIC AVERAGE	P.E.
All Freshmen	172	48.04	0.68	73.52	0.76
Athletes	46	47.49	1.16	69.54	1.19
Non-athletes	126	48.04	0.89	75.00	0.88

course itself. Looking at the intelligence and academic ratings we have the rather unusual circumstance of perfect correlation, the groups ranking as follows from the highest to the lowest: teaching, pre-engineering, business administration, general and pre-medical. Uncertainty of aim probably accounts in part for the poorer class work of the academic group.

Forty-six students or about 26 per cent of the total number of freshmen were members of either the football or basketball squads. The comparison of intelligence ratings in table 3 between the athletes and the non-athletes reveals no significant difference. The athletes were five and one-half points below the non-athletes in their studies. The difference, however, is not so great as to justify the charge sometimes made

that the participation of freshmen in athletics results in complete demoralization of their scholastic work.

The comparison in table 4 of the standing of students drawn from Kentucky with those from other parts of the south, from the north central states, from the esstern states and from all

TABLE 4

Comparison of home of student with ability and achievement

HOME	NUMBER	MEDIAN SCORE ON OTIS TEST	P.E.	MEDIAN ACADEMIC AVERAGE	P.E.
Kentucky	107	46.39	0.73	73.28	0.97
Southern states	15	48.75	3.10	70.84	1.61
Central states	27	55.50	2.05	69.64	2.12
East	15	53.50	1.52	75.62	1.57
All states exclusive of Kentucky	65	53.43	1.31	73.85	1.05

TABLE 5

Comparison of age of student with ability and achievement

AGE	NUMBER	MEDIAN SCORE ON OTIS TEST	P.E.	MEDIAN ACADEMIC AVERAGE	P.E.
16	4	62.50		85.00	
17	21	54.37	2.01	77.50	2.21
18	46	51.42	1.58	73.75	1.81
19	50	46.66	1.25	72.77	1.15
20	27	45.41	1.34	69.69	1.59
21	14	43.00	1.67	68.33	2.76
22	7	51.87	3.62	74.16	2.36
23	2	45.00		82.50	
24	0				
25	0				
26	1	37.50		82.50	

states exclusive of Kentucky might suggest two things: first, it appears probable that the group from Kentucky is more unselected in nature and their mental rating more representative of that of the average student than is the case with other groups; and second, that in scholastic work, Kentucky boys receive

preparatory training for college which enables them to hold their own against the representatives of other states.

That younger members of a class are usually the brighter, and that often the more mature student through better application and hard work may secure marks on studies which would not be expected from a knowledge of his mental ability, are some of the generalizations supported by table 5. The four sixteen-year-olds led all other ages on both intelligence tests and in scholastic work. There is a fair tendency for those 18, 19, and 20 not to work up to the limit of their ability. The twenty-six-year-old boy is a Japanese with a somewhat faulty command of English and a high determination to get the most out of his work. The former would be a handicap on an intelligence test. Over half of the one hundred and seventy-two freshmen are either 18 or 19 years old, while five-sixths of them are included in the ages 17 through 20. No attempt was made to compute the probable error for the ages 16, 23 and 26 because the number of cases did not justify it.

SUMMARY AND CONCLUSIONS

In conclusion we ask ourselves this question to what extent is a student's success during the first half of his freshman year determined by the factors considered i.e., his father's occupation and its social and mental implications, the course he elects, his relation to athletics, the location of his home relative to the college, and his age? The following conclusions are suggested by the studies:

1. The possession of a degree of intelligence adequate to cope with college work is more essential to success than any of the foregoing factors.

2. Deficiencies in intelligence as shown by the Otis test are commonly accompanied by deficiencies in scholastic achievement.

3. Purpose in college growing out of a realization of the value of the work is a powerful factor affecting success. This fact was constantly encountered in the studies, although it is not so

obvious on the face of the tables cited. On the other hand, no matter how favorable the home and college environmental factors and fitness of age, the freshman who sees slight personal value in his college courses has but little purpose to guide his efforts and falls short of his best performance.

4. The five factors are not so direct in their bearing on student success as they may be the indication of or channel through which mental ability and purpose in study operate.

THE RELATION BETWEEN CRANIAL CAPACITY, RELATIVE CRANIAL CAPACITY AND INTELLIGENCE IN SCHOOL CHILDREN

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The children whom we are about to consider were given the various measurements, mental and physical under the auspices of the Harvard Growth Study. These children were from the school populations of Medford and Revere, near Boston and were all in grade one and six years of age when they received their first measurements. The growth study began in the school year 1922–1923 and is still proceeding. Under this scheme these same children are put through the measuring program every year.

The children were divided into three broad racial groups, North European, Italian and Jew. Needless to say there is a very serious question as to whether we can term these groups racial or not. North European simply meant that the parents originally came from North Europe or the British Islands. The Italian group comprised all children whose parents were Italian while the Jew group explains itself. In order to bring these down more to a racial basis the writer has herein divided the North European group into pure blonds, mixed and pure brunettes on the basis of hair and eye color. He also only considers those Italians who are pure brunettes, excluding all who had either blue eyes or fair hair. All Jews are included since the sample was somewhat small.

The actual intelligence quotients which we are to consider are those derived from the Dearborn A Group Test of Intelligence as given in the year 1923–1924 (children aged seven), from the Otis Group Intelligence Test, Primary Examination given in 1924–1925 (children aged eight), and from the Stanford

Revision of the Binet Simon Test given at various times but mostly in 1922–1923 (children aged six). The Binet was given only in Medford at that time and since the Italian and Jew samples are drawn largely from Revere we can only consider the Binet as applied to the North European group. All the children in these groups are of the same age, since the growth study was started when all were six years old.

The physical criteria with which we are here dealing were taken in the second year of the growth study (1923–1924). Cranial capacity was calculated by the Pearson-Lee formula.[1] This is as follows:

Male:
Brain cc. = 0.000337 (L—11 mm.) (B—11 mm.) (H—11 mm.) +406.01
Female:
Brain cc. = 0.0004 (L—11 mm.) (B—11 mm.) (H—11 mm.) +206.6

This formula was employed just as it stands, the male formula being used for boys and the female for girls.

Porteus[2] uses the male formula for both sexes but the writer frankly cannot see the justification of this. In young children, owing to the undeveloped brow ridges he would prefer using the female formula for both in preference to the male.

The utility of this formula, for determining cranial capacity in seven-year-old children—as these are—is highly questionable. It is, of course, derived from adults. Professor Karl Pearson in a letter to the writer expresses himself as follows:

"I should personally hesitate extremely to use either male or female *adult* formulae for children, the average thickness of the bones is so very different," and again, "I should be slow, however, to combine negro and Jewish children together with North Europeans, and doubt whether the same reconstruction formula would apply to both, the correlation for, say, English

[1] Lee, Alice. Data for the Problem of Evolution in Man. Transactions Royal Society, vol. 196, 1901, page 225.

[2] Porteus, S. D., and Berry, R. A. Intelligence and Social Evolution. Publication of the Training School at Vineland, N. J., vol. 20, May, 1920, page 24.

TABLE 1

Correlations between I.Q.'s and Physical Measurements

The I.Q.'s obtained by giving the Dearborn A Group Test of Intelligence, the Otis group Intelligence Test, Primary Examination, and the Binet (Stanford Revision) to groups of children from the school populations of Medford and Revere. These groups are largely inclusive of each other and the children are all of one age.

Intelligence Quotients

GROUP	DEARBORN A			OTIS			BINET		
	Number	Mean I.Q.	S.D.	Number	Mean I.Q.	S.D.	Number	Mean I.Q.	S.D.
Male									
Italian (Brunet)	54	99.25	13.55	74	99.50	10.85			
Jew (All)	39	104.26	12.16	47	106.47	10.83			
North European Blond	34	107.65	13.40	70	108.57	13.62	43	103.40	12.41
North European Mixed	27	109.43	12.06	56	107.72	12.62	35	102.72	11.66
North European Brunet	18	111.61	13.19	38	112.53	11.29	24	102.42	10.40
Total North European	79	108.72	12.78	164	109.20	12.91	102	102.93	11.71
Total Male	172	104.53	12.91	285	106.23	12.75			
Female									
Italian (Brunet)	42	98.33	10.45	66	99.12	10.77			
Jew (All)	31	107.02	12.20	39	104.18	10.43			
North European Blond	62	107.56	12.80	103	108.75	11.76	71	102.21	9.44
North European Mixed	61	107.16	11.31	76	108.25	12.12	51	100.14	10.05
North European Brunet	21	108.37	10.99	37	110.65	12.50	27	102.74	13.86
Total North European	134	107.51	11.83	216	108.90	12.04	149	101.60	10.63
Total Female	207	105.53	11.71	321	106.32	12.26			

Cranial capacity and its correlation with intelligence

GROUP	DEARBORN A			OTIS			BINET		
	Number	Mean cranial capacity	Pearson r	Number	Mean cranial capacity	Pearson r	Number	Mean cranial capacity	Pearson r
Male									
		cc.			*cc.*			*cc.*	
Italian (Brunet)	54	1,193	+0.25+0.09	74	1,207	+0.11+0.08			
Jew (All)	39	1,170	+0.25+0.10	47	1,175	+0.14+0.10			
North European Blond	34	1,232	+0.19+0.12	70	1,241	+0.27+0.07	43	1,249	+0.35+0.09
North European Mixed	27	1,211	+0.26+0.11	56	1,208	+0.43+0.07	35	1,246	+0.25+0.11
North European Brunet	18	1,237	+0.07+0.15	38	1,241	+0.03+0.11	24	1,249	+0.37+0.12
Total North European	79	1,227	+0.21+0.07	164	1,235	+0.29+0.05	102	1,245	+0.31+0.06
Total Male	172	1,209	+0.23+0.05	285	1,222	+0.25+0.04			
Female									
		cc.			*cc.*			*cc.*	
Italian (Brunet)	42	1,019	+0.01+0.11	66	1,039	+0.01+0.08			
Jew (All)	31	1,063	+0.38+0.11	39	1,072	+0.06+0.11			
North European Blond	62	1,071	+0.06+0.08	103	1,072	+0.14+0.07	71	1,092	+0.12+0.08
North European Mixed	51	1,074	+0.18+0.09	76	1,072	+0.03+0.08	51	1,101	+0.03+0.09
North European Brunet	21	1,073	+0.07+0.15	37	1,072	+0.21+0.11	27	1,084	+0.12+0.13
Total North European	134	1,072	+0.12+0.06	216	1,072	+0.11+0.05	149	1,093	+0.08+0.05
Total Female	207	1,061	+0.16+0.05	321	1,064	+0.12+0.04			

TABLE 1—*Continued*

Stature-capacity index and its correlation with intelligence

GROUP	DEARBORN A			OTIS			BINET		
	Number	Mean stature-capacity index	Pearson r	Number	Mean stature-capacity index	Pearson r	Number	Mean stature-capacity index	Pearson r
Male									
Italian (Brunet)	54	1.028	−0.16+0.09	74	1.032	−0.03+0.08			
Jew (All)	39	0.991	+0.13+0.11	47	0.983	+0.21+0.09			
North European Blond	34	0.999	+0.09+0.12	70	1.021	+0.06+0.08	43	1.017	+0.00+0.10
North European Mixed	27	1.008	+0.17+0.12	56	1.011	+0.35+0.08	35	1.028	+0.23+0.11
North European Brunet	18	1.004	+0.04+0.15	38	1.014	+0.02+0.11	24	1.001	+0.34+0.12
Total North European	79	1.003	+0.11+0.08	164	1.016	+0.15+0.05	102	1.017	+0.14+0.07
Total Male	172	1.008	−0.03+0.05	285	1.015	+0.08+0.04			
Female									
Italian (Brunet)	42	0.875	−0.07+0.11	66	0.908	−0.13+0.08			
Jew (All)	31	0.884	+0.16+0.12	39	0.911	−0.11+0.11			
North European Blond	62	0.882	+0.01+0.09	103	0.908	−0.04+0.07	71	0.910	+0.10+0.08
North European Mixed	51	0.900	+0.04+0.09	76	0.910	−0.07+0.08	51	0.922	−0.12+0.09
North European Brunet	21	0.900	+0.18+0.15	37	0.909	+0.14+0.11	27	0.906	+0.04+0.13
Total North European	134	0.891	+0.08+0.06	216	0.909	+0.01+0.05	149	0.913	+0.01+0.06
Total Female	207	0.888	+0.07+0.05	321	0.909	+0.00+0.04			

and negroes being so different." The writer is, therefore, using these formulae of Lee as the best present means of calculating cranial capacity but fully realizes that his results cannot be regarded as highly accurate in so far as cranial capacity is concerned.

The stature-capacity index is an attempt to get around absolute brain size and to correlate intelligence with relative brain capacity. It consists of the stature in millimeters divided into the cranial capacity in cubic centimeters. Thus the greater the cranial capacity relative to stature the higher will be the index.

The reason for using the stature-capacity index is fairly clear. The brain very evidently has something to do with intelligence and it would seem only reasonable to suppose the larger the brain relative to the size of the individual, the greater would be his or her intelligence.

The results of this investigation are shown in table 1 which is self explanatory. The correlation coefficients quoted are the usual Pearson r's worked out by the scattergram method.

An examination of this table, will show that the correlations between gross cranial capacity and intelligence are always positive and while low are sometimes significant. On the other hand when we turn to *relative* cranial capacity these correlations appear to be absolutely without significance. They are both positive and negative and are in all cases without significance from a statistical point of view. These results would seem to indicate that for these ages at least and for the racial groups involved intelligence probably had a low yet significant correlation with gross cranial capacity but bears no relation whatsoever to relative cranial capacity.

NOTES AND NEWS

The John Simon Guggenheim Memorial Foundation which has plans for awarding annually approximately fifty fellowships for advanced study abroad has announced some fifty-seven grants for the year 1929. Applications should be made to Henry Allen Moe, Secretary, John Simon Guggenheim Memorial Foundation, 551 Fifth Avenue, New York City, before February 1st of the year preceding the one for which the award is desired.

The American Red Cross Roll Call for members for 1929 will be held this year as usual from Armistice Day to Thanksgiving, November 11th to 29th.

The Secrétaire Général: Paul Masson-Oursel, of the Congress International de Psychologie appliquée has requested us to announce that the definite date for this Congress will be from March 21st to 27th, 1929. Early plans were for these sessions to be held in October of this year. Like many other scientific meetings this Congress meets under the auspices of the Institute International de Coopération Intellectuelle de la Société des Nations. Those interested should address the Secrétaire Général P. Masson-Oursel, 35, Rue Boissy-d'Anglais, Paris, (8)e.

The Carnegie Foundation for the Advancement of Teaching will distribute without charge to those interested bulletin twenty-one-"Present-day Law Schools in the United States and Canada." As a part of his preparation for this work the author, Alfred Zantzinger Reed, visited just before the War all the law schools then in existence in the United States and in 1924 all such in Canada. One of the chief findings is that the formal organization of these law schools and admissions to the bar no longer correspond to the facts of professional life. The activities in which individual lawyers engage differ from each other quite as markedly as do, for instance, the various branches of the healing arts. The theory of the law is that all lawyers are, or at least ought to be, prepared to become members of a single undivided profession. While this conception grew up naturally in simple agricultural communities it cannot be perpetuated in a highly specialized commercial age. Selective bar examinations and diversified types of law schools, dividing lawyers into socially disconnected and separated recruited professional groups, have

converted the tradition of a unitary American "Bar" into little more than a legalistic fiction."

Less than two-thirds of the law schools are connected with a college of Liberal Arts. There has been a general increase in amount of time needed to become a lawyer and a corresponding increase in night law schools. The author criticises the exaggerated development of the elective system and favors the reëstablishment of the entrance examinations. Anyone desiring a copy of this bulletin should write to The Carnegie Foundation, 522 Fifth Avenue, New York City.

Dr. Morris S. Viteles of the University of Pennsylvania has been invited to address the Fifth International Congress of Psychotechnique which will meet in Utrecht, Holland during the month of October.

Professor J. R. Gentry will return to the Department of Psychology at Ohio University after a year's leave of absence at Harvard.

Professor Amos C. Anderson returned from a year's leave spent at Yale to resume teaching during the summer and this academic year in the department of Psychology at Ohio University.

For the past summer quarter Professor Edward A. Bott of the University of Toronto and Kate Gordon of the University of California at Los Angeles were on the staff at Stanford University.

Dr. Robert H. Seashore who has been a national research fellow at Stanford University for the past two years has been appointed Associate Professor of Psychology at the University of Oregon.

Dr. Calvin P. Stone on leave from Stanford University for 1928–1929 will be a member of the research staff of the Institute for Juvenile Research, Chicago.

BOOK REVIEWS

H. A. OVERSTREET. *About Ourselves—Psychology for Normal People.* New York: W. W. Norton and Co. 300 pp. $3.00.

This book is in the same series with Martin's *Psychology*, Bertrand Russell's *Philosophy* and J. B. Watson's *Behaviorism*. It is composed of lectures delivered to a large group of business and professional men and women in the New School of Social Research, and it bears the marks of such an origin. Diffuse enough to be listened to continuously without excessive effort, distinctly personal, and with considerable emotional appeal, it carries the reader along with a sense of sympathetic *rapport* such as probably existed between an enthusiastic, occasionally effervescent, leader and the group that "helped to make this course in adult education not one in which the lecturer was a little-tin-god-in-a-pulpit handing out predigested wisdom, but one in which the lecturer and the group were co-workers in a common enterprise."

There are two "Parts"—"Towards Unreality" and "Towards Reality." Under the former head there are chapters on regression to the infantile, fixations, projection and introjection, "wish-thinking" (i.e., rationalization), "microparanoia" (a neologism for "paranoia-in-the-little" found among fairly normal people [One wonders why he did not say hypoparanoia]), hysteria, mild manic and depressed conditions, and phobias—all as examples of inadequate adjustment to reality.

These chapters are built around simple stories of typical cases, and are admirably adapted to give a beginner some idea of what clinical psychology is about, and to get him into the habit of looking for real psychological explanations of human weaknesses. They are not meant for experts or for students in search of close definitions and fine distinctions.

In Part Two the author discusses ways of producing courageous and expansive rather than cowardly and contractile attitudes towards life (which he takes pains to distinguish from the extraversion and introversion of Jung). The ten chapters include discussions of music, perception, poetry, and the art of conversation, but all with the same aim in mind, to liberate the reader from "particularity" or the bonds of the mere this-and-that, not only through science but through the universalized attitude that gets expression in genuinely good music and other art; to foster attempts at creative art, even in children; to encourage a sense of humor, which is itself nothing but the ability to transform contractile

attitudes into expansive; and, finally, to develop the "intercreative mind" or the spirit of sympathy and co-operation in the solution of life's problems.

In this second part of the book, as in the first, there is much to give useful insight to the beginner, and for the expert a good many refreshing reminders. The present reviewer finds that the book arouses interest amongst a class of beginners in mental hygiene.

DANIEL B. LEARY, PH.D. *That Mind of Yours.* Philadelphia: Lippincott. 226 pp. $1.75.

In this book, which contains less than half as much printed matter as Overstreet's, Dr. Leary attempts to cover the whole field of normal and abnormal psychology in brief and simple summary. Written in the first place as a series of newspaper articles, it is an excellent example of what can be done in the way of simplification without sacrifice of poise and scholarship. If one pictures Overstreet in the midst of an enthusiastic group working for emotional transformations, he sees Leary in the midst of his books working hard to get the essence of it all and then going over whatever he may have written, to leave out unessentials and make every word count.

What is discussed in such a compendium? Psychology as a point of view, seeing man as he is in the light of his origin and the world he must face; sensations, 'a drop of lemon juice on your tongue without your knowing what it is or that it is your tongue that is stimulated'; realizations of meaning, "gestalt," percepts and concepts; life as response and adaptation; reflexes, instincts ("it is necessary to stress the adaptability strongly"), emotions (none of these "lurking to rush out"); nature and nurture; responsibility and necessity; consciousness (If one could only leave it out!); introspection; behaviorism; thinking, helpful and hurtful; words and gestures as symbols; drives and mechanisms; resulting prejudices that distort one's thinking, especially about human beings; the need for psychoanalysis and the difficulty of teaching psychology to a public saturated with false assumptions; habits and the need for their constant revision; memory ("we should stress the native readiness more than the repetition"); illusions, hallucinations; memory training ("the best way is to sleep well, eat the proper food, get the right air, exercise and relaxation, and avoid worry and excitement"); images (inaccurate, useless and detrimental to clear or abstract thinking).

So much for "the field of the normal" in 80 pages. The "field of the abnormal" (a wider term than "pathological") takes 96 more, equally good. Then come 25 pages of "wider applications," and after that 5 pages of bibliography usefully annotated.

PERCY GOLDTHWAIT STILES of the Harvard Medical School. *Dreams.* Harvard University Press, 1927. 80 pp. $1.50.

If this were a technical book on dream interpretation, the reader would ask many critical questions: How can anyone imagine that illustrative drawings made many years afterwards will reproduce the very imagery of the dream itself; why do the explanations given ignore so much of the dream content; how can one check up interpretations when imagery is treated in one part of the book and emotion (though not entirely) in another; and why is it all so free and easy? True though it is that in interpretation one must "respect the dreamer's intuition" (by which he doubtless means his sense of precise emotional correspondence), the author has not always made it clear that it is the "intuition" rather than some preconception, especially in the case of the "intestinal" dreams, that makes a given interpretation seem to fit.

But it is not a technical book on dream interpretation. It is the book of a reasonably well-read amateur telling his own experience. Thirty years ago, as a youth of twenty-two, when dream literature was by no means what it is today, he began to make a record of his dreams, and kept it up, with interruptions, ever since, until now he has put it all together in this charming little book.

The individual dreams are interesting; and so is the author's review of the different senses involved and other comments and conclusions. But the main value of the book lies in the long sweep of the record in relation to the developing life of the writer; the apparent failure of the dreams, for instance, to reflect current events and vital interests (except for the grief attending bereavement); such a thing as the repetition after twenty-three years of a dream effort to find the "unknown room" in his boyhood home; the entire absence of anger and of religious and patriotic emotions from the dreams, though they were frequent enough in waking life; the lack of any growth "in prudence and sagacity" on the part of the dream self, through all the thirty years that the record covers, for "his mental age has remained for a generation at about ten or twelve."

All this appears to be consistent with "the favorite assertion of the author that the dreams of a healthy man have some of the diverting value of holiday outings."

But how can a stranger be quite so sure that it is all so entirely healthy and holiday-like? The author believes that in sleep fatigue holds in abeyance "the engrossing cares of the day" so that, for the most part at least, they get no expression in dreams. But how about the dreams "just beyond recovery" that tantalize his efforts at recall? May they perhaps reflect the present cares that "fatigue"—or shall we say repression?—keeps well out of sight? Or if the author didn't have such present-tension dreams, why didn't he? And this brings us to

another view of the book. Can it be used, with all due apologies and expressions of respect, as an exercise book for beginners in individual psychology who are trying to find people's "patterns"? Here are the dreams, the interpretations (or misinterpretations, it doesn't matter), the *obiter dicta*, the "of courses," the generalizations and the other witting or unwitting self-revelations of one individual, a man of parts, who is willing (in spite of his aversion to bathing before a roomfull of spectators in his lecture theatre) to give us glimpses of himself off parade and of the queer emotions and ideas that possess him during sleep. Well, what is he? And why are the dream *motifs* and emotions cast in such and such a mold? Why, for example, has the waking personality never absorbed the ten- or twelve-year-old dreamer? What was that hidden room of horror, that black recess that he forced himself to leave his stepmother and peer into, that curse on the village, that insupportable stench? What is or was behind that terrifying fear of falling? What was the blinding, staggering explosion that carelessness could or did bring on? Why did he have to see horrifying mysteries? Why is he so deeply ashamed when his moron dream-self subtly ridicules a friend or gets ready to lie to his aunt? Why does he believe that "one of the tendencies common to childhood and to dream life is the impulse to make excuses for one's sins of omission and commission?" Why must he be everlastingly solving useless problems in his sleep, though never when awake? ("The chief reason for supposing it to be a dream is that the question seems hardly worth while," p. 71). Why have wholly pleasurable emotions "not been very frequent" in his dreams? And so on, indefinitely. And if the author of this book should come to you some day and say that his busy life was more exhausting than it ought to be, where would you start in to ease the load?

Such exercises in long-distance diagnosis have their value. If one could only check them up by reference to another volume in which the kindly author completes his service to psychology by giving the results of a thorough psychoanalysis—No, it need not be by a Freudian!

H. Austin Aikins,
Western Reserve University.

Carter V. Good. *How to Do Research in Education.* Baltimore: Warwick and York, Inc., 1928. Pp. 298.

How to Do Research in Education is the name of a recent book that is intended primarily for the seminar group in education. The author of this volume has attempted to bring together and organize the relatively large body of information on educational research that is now available. The need for such a volume is expressed in the following:

"When the average student begins his graduate work he is almost wholly innocent of any knowledge of the techniques of research. A dis-

couragingly large number of these students manage to remain in the graduate school a year or two without having become particularly adept in methods of research. . . . . Too frequently the student must discover information concerning research procedures by the wasteful trial and error method, although there is always the opportunity for profiting by conferences with professors, class instruction, contacts with more mature students, and individual reading. However, it should be necessary neither for the student to waste time in discovering by chance basic information concerning research principles nor for the professor to consume his time in repeating to different students information which could be presented systematically in an organized class group" (p. 5).

Those who write upon the various phases of educational method are sometimes merely educational bystanders who proffer suggestions as to how educational practitioners may better accomplish their tasks. This fact is of course no secret to the experienced classroom teacher. The latter knows that the educational methodologist is frequently merely an onlooker whose suggestions may bear little or no relation to the *actual* school situation. One of the chief merits of the book under review is the fact that the author relays to his reader some firsthand experience.

It was of course inevitable that a book dealing with methods of educational research would confine itself largely to general principles. The most concrete treatment is naturally given to such topics as bibliographical form and the other mechanical and routine aspects of research. One very pleasing feature of the volume under review is the up-to-date character of the references. The latter are brought down to March, 1928, inclusive.

Opinions will naturally differ as to the value of this book. Many research workers possess an artistic temperament and some of them will no doubt cherish the conviction that they are the only really competent guides for students who wish to do research work in education. The limitations of any volume which seeks to guide the research worker will of course be obvious to all who have done original work. However, it is the judgment of this reviewer that the leader of a seminar group will find it time-saving to require his students to read certain portions of the present volume by Professor Good. Indeed the experienced writer and even the experienced publisher would probably profit by perusal of this volume.

BATE, WILLIAM G., AND WILSON, ELIZA ANN. *Studies in Vocational Information.* New York: Longmans, Green and Co., 1926. Pp. iv + 168.

The work of the vocational counselor is extremely difficult. In many instances vocational guidance is the name given to a type of work which an employment bureau legitimately follows. The vocational counselor

in many instances is therefore little more than manager of an employment bureau housed in a school building. In numerous instances, the guidance follows a perfunctory interview in which few or no valid tools or devices are employed. Such guidance often takes place hurriedly at a time when the pupil *must* secure within a short period of time some type of work. This last-minute placement often disregards the pupil's abilities and interests. It is obvious that pupils ought to begin to think about such matters long before they are faced with the necessity of securing a job.

A recent volume has been developed for the purpose of giving boys and girls of junior high school age an opportunity to study some of the important facts which they ought to know when they begin thinking about their life work. Too frequently young people go blindly into a complex industrial situation that often perplexes even those who have sought seriously to prepare for it.

The authors have not attempted to produce anything new or essentially different from the books already written. Rather they have attempted to gather material that is already available and to combine with its use as many as possible of those sources of first-hand information that are present in every community. For example, in addition to studying the text and the suggested reference readings, the authors urge that the pupils visit factories, stores, and other places of industry and business, in order to gain information at first hand. Although watching someone at work does not teach the child a trade, it seems reasonable to assume that such visits will give children a much more intimate knowledge of the nature of an occupation than could ever be gained from mere reading about it.

By way of supplementing the material included in their text the authors have included a series of suggestions to teachers. The nature of the course which the authors had in mind when they prepared their book may best be summarized by quoting from their suggestions to teachers. "The chapter on studying occupations of interest is the one to which, of course, the greatest attention must be paid and the one which involves the most hard work and study on the part of pupil and teacher. It is well, after plans of study have been outlined, to abandon class recitations or discussion and to form a study group during which time the teacher gives her attention to helping pupils to find material and to organize it for special reports. The material collected should be from first-hand sources whenever possible, supplemented with what may be found in written form. Whatever plan of collection and organization of facts concerning an occupation may be used it should result in the pupil's having in his notebook, either in written or mimeographed form, a body of well organized material concerning a number of occupations. The class discussions following this period of study should do much to

clear up points of doubt in the minds of pupils and to make possible a fairly correct summary of facts" (pp. 164–165).

HARVEY C. LEHMAN,
Ohio University.

L. T. TROLAND, Harvard University. *Fundamentals of Human Motivation.* New York: D. Van Nostrum Publishers, June, 1928. Pp. 1–521.

Is it a paradox of the problem of motivation that we should seek a mental explanation of a physical act? L. T. Troland, author of a new book entitled *Fundamentals of Human Motivation* thinks not, and says not most decidedly.

"The behavior, true enough," says he, "is physiological and can be described in material terms—but when we question the motive of this behavior, we are asking for the thoughts and desires of the individual and these are surely mental." "Evidently then," our author continues, "the problem is psycho-physiological"—and as such, he treats it.

The book is not intended to be a popular discussion but rather a scientific analysis of the motivational problem, confesses Dr. Troland, and the reader needs nothing short of a thorough course in physiological psychology, neurology, physics, higher mathematics, ethics and philosophy to enable him to digest the phraseology and scientific inferences found in the book. For instance—

"The solution of the whole problem of motivation" says the author, "rests upon the physiological interpretation of the pleasure-pain senses" which he dignifies by the name of "retroflex action." In order to establish a relationship between these physiological processes and consciousness he assumes "that affectivity or the degree of pleasantness-unpleasantness, is proportional, at all times, to the rate of change of conductances in that portion of the cortical process which underlies consciousness. . . . . The resulting doctrine comprises a form of psychological hedonism according to which voluntary choices are determined by the summation of all past affections."

Now the above is pretty clear thinking and rings true, no doubt, to the student of advanced psychology but the lay reader even though "educated" in the ordinary sense of the word will still be left wondering, after wading through the 502 pages of *The Fundamentals of Human Motivation*, why people behave as they do and what the author really means.

WILLIAM F. BOOK,
Indiana University.

FRITZ, GIESE. Methoden der Wirtshaftspsychologie. *Handbuch der biologische Arbeitsmethoden*, Abt. VI, Methoden der experimentellen Psychologie, Teil C–II, Heft 2, s. 119–744.

A monograph of 600 pages without table of contents or index is an academic monstrosity. Aside from this shortcoming the work is a real contribution. It deals with employment, training, industrial relations, general efficiency and advertising.

The treatment of vocational problems includes description of a very considerable number of tests,—in short a veritable manual. Most of them are the individual type with elaborate and usually automatic recording devices. The method of making individual test profiles, so widely used in Germany, is described. Practice curves are discussed; also various unique devices for training and diagrams showing right and wrong ways of performing operations. The treatment of industrial unrest follows conventional lines. In connection with time study there is mention of psychological methods of selecting the man who makes the studies. Motion study is elaborated along Gilbreth lines. The sections on fatigue consist mainly of description of a great variety of dynamometers and ergographs with briefer mention of rest pauses and special handles on tools. Then follow brief discussions of the following: music, rhythm, monotony, arrangement of work place, methods of transporting loads and special desks or work benches. Illumination is then treated with especial reference to intensity and distribution. Prevention of accidents by technical devices or propaganda is next. The book concludes with a rather brief discussion of advertising.

As its name implies the work is a survey of methods rather than results. We read about a lot of apparatus and cannot help but wonder how useful it proved and how reliable a measurement it gives in the statistical sense. But the book does cover a lot of ground and gives the reader interested in this field many ideas he may wish to try out himself. The fine print sections that are largely illustrative or get down to "brass tacks" are often more interesting than the body of the text. The work is profusely illustrated,—251 of them. It affords a pretty good summary of post-bellum developments of industrial psychology in Germany. It is the only comprehensive effort to cover the whole field with fairly uniform emphasis of all parts since Munsterberg's *Psychology and Industrial Efficiency*, 1912.

FRITZ, GIESE. Psychologie der Arbeitshand. Berlin: Urban und Schwarzenberg, 1928. S. 325.

This is a discussion of every conceivable activity in which the hand (or arm) participates. Some of it goes beyond the field of psychology but this fits in so well with the logical arrangement that no fault should be found.

The first section is "psychophysical" and is devoted largely to techniques and apparatus for measuring tactual and kinaesthetic sensations and motor control. It also goes into questions of handedness. The next section is from the comparative standpoint: monkeys' manual dexterity; motions of young children; degenerates and their peculiarities of grip; anatomy of the hand and typical handwriting in old age; drawings of primitive folk; sex factors,—typical female activities such as sewing and crocheting. The third section is "practical." It includes pedagogical aspects (Montessori); industrial aspects,—time and motion study and training (only 4 pages); "artistic" work,—from slight of hand and billiards to playing piano and stringed instruments. There is discussion of some typical systems of musical instruction and of apparatus for practicing particular muscle groups for musical purposes. This section also deals with physical education,—gymnastics and boxing and methods of using the hand in massage; also pathological conditions due to disease, industrial injury or paralysis with therapeutic devices and principles for amputated or partially paralyzed arms. The last section deals with the "expressive" hand. It includes proportions of the hand in works of art, the use of gestures, aesthetic dancing, the occult,—muscle reading and character analysis—graphology with appropriate emphasis on statistical analysis, criminology (finger prints) and finally the hand alphabet for mutes and the Braille system for the blind.

The book is well written and well illustrated. It is comprehensive to say the least. The reviewer did not realise there was so much that could be said about the hand. Probably it could be said more concisely if desirable. There are a good many practical points scattered through it although the general treatment is more methodological and descriptive. Few people will care to read it as a whole but anyone with a problem involving the hand may well consult the index. It will not appeal to the readers of this JOURNAL as much as the other book by the same author on *Wirtschaftspsychologie* reviewed simultaneously.

HAROLD E. BURTT,
Ohio State University.

ROBERT SIDNEY ELLIS, PH.D. *The Psychology of Individual Differences.* New York: D. Appleton and Co., 1928. 553 pp.

There has been a niche awaiting a good text in the field of individual differences. At last it is filled. The book contains a surprising amount of material, and furthermore it is written in readable and interesting style. One volume cannot, of course, be an exhaustive treatise upon the whole field of individual differences but we do have here a rather complete outline of the subject which provides the student with an excellent beginning and a bibliography which will enable him to delve more deeply

into the subject if he cares to do so. Furthermore it is a safe guess that many students will be stimulated to extend their studies. The author has avoided that "closed chapter" insinuation that there is nothing more to be said on the subject and usually manages to leave one hungering and thirsting for more information.

The author confesses to some slight bias toward believing that heredity is a more important determiner of individual differences than is environment. Such an admission is fair warning to the uninitiated reader, and occasionally he needs it. The author is not a "bitter ender" believer in heredity, but perhaps it would not be unfair to accuse him of suspecting that heredity is the cause of almost any difference until environment is *proved* to be the guilty factor. As a result of the author's conviction we find more emphasis upon biological and structural aspects of differences rather than upon acquired and functional elements.

One rather unusual idea advanced was the author's belief that he was avoiding the difficulties involved in the IQ by using a chart of lines representing growth curves of mentality and reading the final mental ages at the ends of the lines instead of using an IQ. The curves are determined by plotting on squared paper the intersection of mental age and chronological age lines—M.A. being represented on the axis of ordinates and C.A. on the axis of abscissas. Therefore it would seem to the reviewer that the author is merely substituting a graphic IQ for a numerical one, instead of disposing of the IQ. What is worse is the addition of the reading of the final M.A. from the chart. Here he adds the moot question of the endpoint of development to the "errors" of the IQ. It seems to the reviewer that the author has jumped from the frying pan into the fire. Perhaps some further defense of the practice may be presented in the future, but on the basis of available information the author does not seem justified.

Several of the later chapters contain attempts to apply the knowledge of individual differences available to a number of social fields, e.g., government, religion, education, business, etc. Some of the applications are actually in use; others are speculative. The author points out the possibilities of social inefficiency from including one eccentric individual on a jury; by allowing laws to be made of, by and for one group of individuals, viz., the lawyers; by intolerant demands for standardized religion, etc. No doubt many of the author's applications will stir up some antagonisms, but the reviewer feels that he ought to be commended for his ability to make us question how well our social institutions actually fit human nature. Whether we agree with his speculations is immaterial; that he makes us think is important.

STUART M. STOKE,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Die Afstomping van Gemoedsaandoeninge. H. F. VERWOERD. Annale Van die Uniwersiteit, Vol. III, December, 1926. Nasionale Pers. Beperk, Kaapstad. 125 pp.

Aptitude Testing. CLARK L. HULL. World Book Company, Yonkers, N. Y. 535 pp.

Detroit Advanced First Grade Intelligence Test. Devised by HARRY J. BAKER. World Book Company, Chicago, Ill.

How to Do Research in Education. CARTER V. GOOD. Warwick & York, Baltimore, Md. $2.60. 298 pp.

Mental Tests for Pre-School Children. DOROTHY KERN HALLOWELL. University of Pennsylvania, Philadelphia, Pa. 21 pp.

The Measurement of Socio-Economic Status. VERNER MARTIN SIMS. Public School Publishing Company, Bloomington, Ill. 33 pp.

Mental Hygiene. DANIEL WALFORD LARUE. Macmillan Company, New York. 443 pp.

The Modern Cat—Her Mind and Manners. GEORGINA STRICKLAND GATES. Macmillan Company, New York. 196 pp.

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* Mention here does not preclude further comment.

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